McGRAW-HILL DIGEST

ENGINEERING • INDUSTRY • SCIENCE • BUSINESS

MAY 1946

AMONG 150 ITEMS IN THIS ISSUE ARE:

SPECIAL FEATURES

New Fields for Plastics..... 1
Television in Color..... 3
War-altered Tool Design.... 6
Design Cuts Plane Cost.... 9
Innovations in Concrete....11
New Facts About Feeding...14
Technical Shorts 16
House Lighting of Future...19
There Is No Defense.....22
New Products 24
New Chemical Equipment..28
Radar Echoes From Moon...31

AVIATION

Planes To Be Seen.....23
Floating Landing Strip.....29
For Extra Load.....33
Also: 2, 8, 9, 18, 21, 22, 24, 25, 26

CHEMISTRY

Portable Oxygen Factory.... 8
Bad Ore—Good Manganese..13
Coal Logs in Production.....18
Also: 6, 9, 10, 15, 17, 24, 28, 32

CONSTRUCTION

Engineered House..... 4
Tilt-up Method 16
Rubble Made Into Blocks....18
Also: 5, 11, 16, 21, 23, 25, 27, 32

ELECTRICITY, POWER

Gas Turbine Progress..... 5
Denatured Plutonium 20
Distribution Economy 23
Also: 6, 12, 14, 15, 18, 19, 27, 30

ELECTRONICS, RADIO

Electronic Exciter 23
Radium Vacuum Gage.....25
Compact Printed Circuit.....30
Also: 3, 7, 8, 16, 17, 24, 25, 26, 31

FACTORY METHODS

Mexican Experiment.....15
Wasted Effort 15
Uses for Stroboscope.....30
Also: 16, 17, 21, 24, 25, 26, 28

FOOD PROCESSING

Weather Profit 8
New Potato Bread.....21
Prepackaging Perishables ...12
Also: 6, 7, 14, 17, 24, 25, 26, 27

MECHANICAL DESIGN

Cantilever Wings 9
Anti-corroding Meters 12
Supercharger Ejector 21
Also: 1, 7, 16, 25, 26, 27

METAL WORKING

Welded Jet Engines..... 4
Turbojet Blades Forged.....15
Dies Made Easily.....29
Hydroneulectric Control 33
Also: 1, 6, 7, 9, 10, 16, 21, 24

MINING

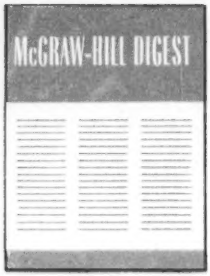
Russian Coal From Donbas... 7
Mining a Cave-in.....10
Nonferrous Metals Market...10
Also: 16, 17, 24, 25, 26, 27

TEXTILES

Shuttleless Loom 5
Better Fitting Hosiery.....10
Worsteds on Cotton Frames..13
Also: 17, 24, 25, 27

TRANSPORTATION

Keeping Wheels on Road...11
Machine Prints Tickets.....12
Shaker Unloads Cars.....20
Also: 16, 17, 24, 26, 27



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In addition, the *"Technical Shorts"* section will be in every issue—reporting new improvements, and adaptations of older methods that have helped to speed manufacturing and processing methods; to reduce manufacturing costs; and to develop better products.

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New Fields for Plastics

Reinforced with woven fabrics, paper, or fibers, resins moldable at low temperatures and pressures are finding new uses ranging from boats to building panels

Reinforced and laminated plastic structural materials which can be molded into curved shapes under low pressure and at low temperature are being used in products such as baby strollers, boats, machine housings, wall paneling, furniture, aircraft structural flooring, and coffins. Some say that these materials mean as much to the plastics industry as reinforced concrete has meant to the construction industry.

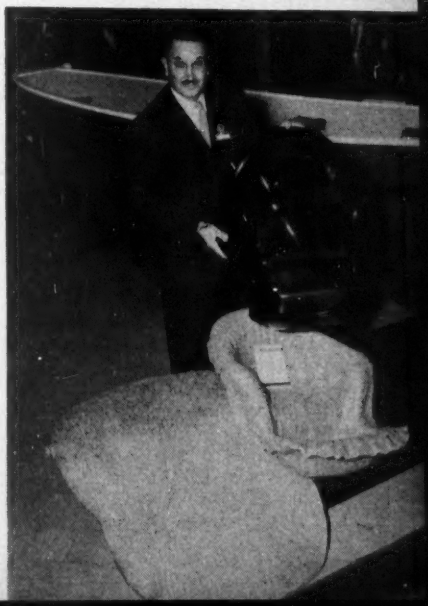
It is the high strength, light weight, corrosion resistance and ease of fabrication in large pieces of complex shape that make these materials outstandingly useful for special applications. Glass-fiber-reinforced plastic may be as strong as aluminum, yet weigh only half as much. These plastics are particularly suited to small-run production where they have an advantage over metal in that expensive machine tools and dies are not needed to form them. They have a labor-saving advantage for some products, such as chairs and boats, ordinarily made of many pieces individually shaped and tediously put together. A reinforced plastic boat or chair is constructed in one piece, from the few sheets which go into the laminate. One manufacturer has built two 17-ft. plastic boat hulls an hour with eight workmen.

When only the cost of the material is considered, laminated plastics may be relatively expensive, but the cost varies so widely with different resins, fabrics, and types of laminate that it is impossible to generalize. One cost estimate for a 12-ft. boat includes $6 for Osnaburg duck fabric, $12 for the plastic at 30¢ a pound, and $20 for the solvent. Labor is put at $24 to bring the total to $62. The price of newer resins may run as high as 70¢ to $1 a pound, while that of the older phenols may be only about 20¢.

Laminated plastic shapes may be made by laying individual sheets of fabric or plywood one on top of the other, by hand, and pouring or brushing the resin over the sheets. Or the laminate can be built up from previously impregnated sheets. Low-cost molds of wood, plastic, concrete, or light metal are permissible.

Heat and pressure to form the laminate into a solid piece can be applied in several ways. One of the first and most widely employed methods is autoclaving. The assembled structure, such as a boat, is subjected to steam pressures and temperature in a closed steel vessel, in reality a large pressure cooker. But before autoclaving, the structure is covered with a rubber blanket and a vacuum is pulled under the blanket to press the material

Baby stroller body of reinforced molded plastic construction and, in background, a laminated plastic boat.



against the form, or mold. Small parts may be enclosed in a rubber bag which is vacuumized.

Laminates also can be pressed against a heated mold by a rubber bag expanded by air or hydraulic pressure. Or the shaping may be done between male and female metal molds. Flat sheets as large as 18x18 ft. are formed in a conventional hydraulic press, a method also being applied to curved shapes to attain high-speed production. The continuous-strip technic is a means of making flat low-pressure laminated sheets at a very high rate. Separate layers of the material, such as paper or woven fabric, are passed through tanks of the liquid resin, then through rolls which press them together, and through a heated tunnel for hardening. Even the high-pressure laminates can be shaped to some degree in heated molds under pressure. A decorative drainboard for a kitchen sink illustrates the product application.

After laminated plastic products have been fabricated and cured they often are roughed and then coated with resin paint or enamel—special coatings are under development.

The low-pressure molding and laminating resins are of three general types: (1) phenol formaldehyde, (2) amines (urea, thio urea, and melamine formaldehyde), and (3) thermosetting ester resins. Depending upon the resin used, the laminating pressure ranges from ¼ to 500 p.s.i. and the temperatures range up to 300 F., although some resins have been adapted to air hardening.

These resins may be reinforced with glass cloth, sisal, paper, woven fabrics, wood veneer, wood fibers, and even metal. For decorative purposes, a fabric with a printed design may be used.

Special high-strength, lightweight laminates for structural aircraft flooring and panels include honey-comb shaped resin-impregnated paper or fabric bonded to plywood or plywood and metal facings and end-grain balsa wood blocks between metal sheets.—BUSINESS WEEK

MIDGET JET ENGINES

Developing more power for their weight than their full-size counterparts, tiny jet engines have been perfected for badly needed wind-tunnel model jet fighter airplane research and for toy model aircraft. Typical of these is Aeromarine Co.'s Dyna-Jet which develops 3 lb. of static thrust. Weighing 16 oz., it is 21 in. long, 2½ in. in diameter at the combustion chamber, and consumes 2½ oz. of fuel a minute. Operating on the ram jet principle of the V-1 buzz bomb, the engine's only moving part is a flutter valve which is opened, to admit a fuel-air charge, by the combustion-chamber vacuum created by the momentum of the discharging gases. It closes under back pressure. Compressed air and a spark plug start the engine. —AVIATION NEWS

TWO DEVICES SEE IN DARK

A German searchlight throws a beam of infrared rays upon objects 2 miles away, and the reflected rays are picked up in a telescope-like instrument in which the object can be seen and identified at night. Vastly cheaper than radar, this device may be useful as a peacetime night watchman.

An American super-conducting bolometer sees 10 to 15 miles in the dark by the infrared rays given off by objects. It has uses ranging from heat-loss studies in industry to research into cancerous growths. —BUSINESS WEEK

Television in Color

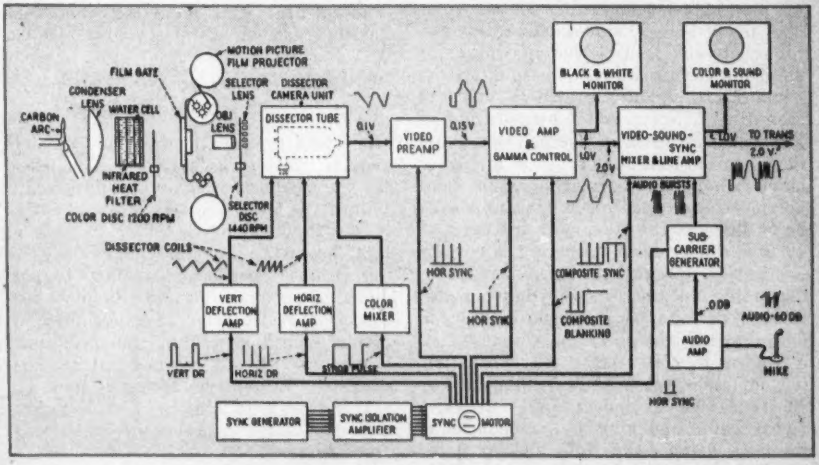
With newly developed equipment, Columbia Broadcasting System demonstrates high quality reproduction of color film on a frequency of 490 mc.

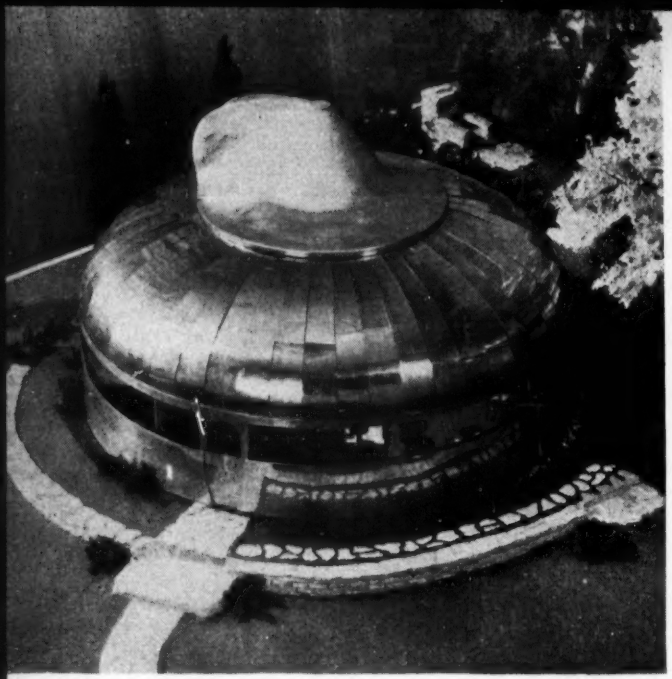
Excellent color pictures have been televised experimentally on 490 mc. by Columbia Broadcasting System. The new method uses a 10-mc. video band to carry a 525-line signal and transmits sound by f-m bursts interspersed with video information.

The intrinsic definition of the pictures is better than that of the 525-line black and white pictures by virtue of the more than proportionally wide band used, and the apparent definition is greatly enhanced by color contrasts in the image. At present, the equipment (see diagram) is limited to pickup from 16-mm. color film and 35-mm. color slides, but a direct pickup is being developed.

Color is introduced into the transmitter signal by a mechanically driven color wheel composed of trichromatic filter segments. It rotates before the camera and a similar wheel rotates synchronously in front of the picture tube in the receiver. The color images are scanned in 525 lines, interlaced 2 to 1, and the interlaced fields are scanned at a rate of 120 per second. Each field is scanned and reproduced in succession through a different primary color in the filter wheel. The three colors are thus presented to the viewer in 1/40th second. The persistence of vision lasts longer than this, so the three colors fuse in the mind of the observer to give multicolored reproduction.

Capable of radiating substantial power while being modulated over a 10-mc. band width, the transmitter uses as its essential component a water-cooled disk-seal triode and has a peak output of 1 kw. Its r-f chain consists of eight stages, a crystal tritet, two triplers, and two doublers with three linear amplifiers. The video modulating chain uses five stages, each conductively coupled so that all frequencies from d-c to 10 mc. are passed with constant amplitude and time delay. The radiator multiplies the transmitter power output 20 times. —ELECTRONICS





ENGINEERED HOUSE—Roof, wall, and floor of this $6,500 hemispherical Fuller house are suspended from a central mast of stainless steel by a system of tubular compression rings and tension rods. Aluminum alloy sheets are stretched tight over the beams, and the ventilator on top draws air through the house. Any strain resulting from pressure is distributed through the entire structure. The house, which has a floor area of 1,017 sq. ft. and a total weight of only 4 tons, features 2 bedrooms, 2 bathrooms, a living room, foyer, and a completely equipped kitchen, as well as a heating and dehumidifying unit. Beach Aircraft Corp. has undertaken mass production. — ENGRG. NEWS-RECORD.

HOW NYLON IS MADE

Nylon is one of the great chemical and engineering developments of all time. The nylon salt, hexamethylene diammonium adipate, is dissolved in water for shipment. This solution is pumped to evaporators and acetic acid is added to stabilize viscosity. After evaporation at atmospheric pressure, the solution flows down through a manifold to an autoclave where further evaporation and polymerization take place, the autoclaves being filled at the start with nitrogen at 40 to 50 lb. pressure. Heating is continued until a specified pressure is reached, depending on the type of polymer desired. The pigment, titanium dioxide, is added to the autoclave mass soon after it begins to boil. After polymerization is complete, the translucent, milky-white substance is extruded and hardened (with water and air) as a ribbon on a rotating drum. Cut into flakes, it is dropped into a receiver and blended. Flake polymer is conveyed to the spinning machines, and from there the filaments are passed down through a cooling chamber and gathered into bundles. Thereafter it is treated the same as a textile yarn.—CHEM. AND MET. ENGRG.

WELDED AUSTENITIC-ALLOY SHEET USED IN JET ENGINE

Operating temperatures around 1500 F. require austenitic stainless-alloy sheet for the combustion chamber and exhaust unit of the GE Type I-40 jet engine used in the P-80 "Shooting Star." Sheets as light as 0.022 in. are assembled by welding because such alloys require no normalizing afterward and do not lose corrosion resistance. They do, however, distort badly, so welding and machining sequences must be worked out to compensate. Resistance welding and lap rather than butt joints on dissimilar sections also aided in preventing stress concentrations.

Longitudinal seams, in some instances, are designed for flush joints requiring no

underside grinding. Pieces are clamped in a fixture and backed by a grooved backing bar. Hydrogen burned in the groove provides backing which assures a uniform clean bead with atomic-hydrogen welding. —THE WELDING ENGINEER

MEXICAN INDUSTRY GAINS

Preliminary compilations of Mexico's 1945 industrial census show a phenomenal growth in industry since 1940. The number of plants with annual production of 10,000 pesos or more has increased from 13,513 to 28,513, number of workers from 389,953, to 512,339, annual payroll from 568,381,284 pesos to 1,002,222,804 pesos (about $206 million). —BUSINESS WEEK

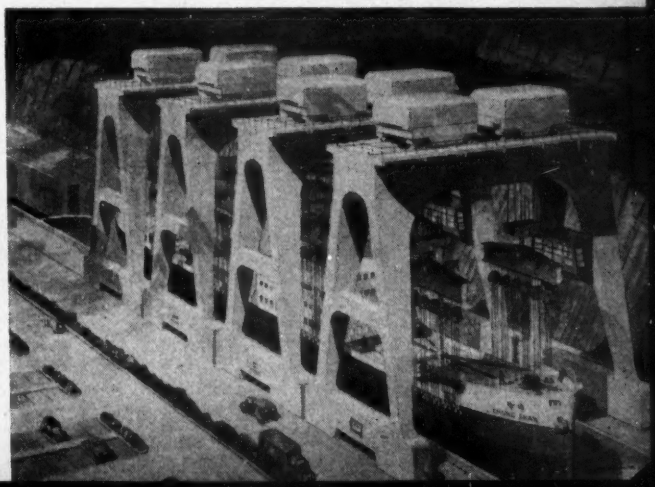
SHUTTLELESS LOOM

A new shuttleless loom, which is likely to find its principal application in making fabrics not suitable for weaving on mass-production lines, is the invention of C. H. Baddeley of Bradford, England. The filling is laid into position between the warp threads in such a way that no temples are required. Only enough tension is placed on the filling to see that it is in a straight line, ready to be beaten up to the fell of the cloth. Two picks are placed in each shed. A separate supply of filling, with a separate guide can be used at each side of the loom. The shedding may be operated by cams, ordinary dobbies, or jacquards to permit weaving a design. If desired, a warp stop motion can be applied. Fringe edges are possible.

The shuttleless loom has utilized cotton, wool, asbestos, jute, seaweed, paper, and glass filler varying from fine counts to actual card sliver. Simple to operate, it is considered suitable for home weaving and for the employment of disabled veterans. —TEXTILE WORLD

GAS TURBINE TEMPERATURES RISE

U. S. Naval Engrg. Experimental Station, Annapolis, Md., has operated a 3500-hp. multistage gas turbine at 3500 F., expects soon to operate at 1500 F. highest temperature thus far achieved. The unit has two multistage turbines in parallel, the first driving the compressor and the second operating the driven unit. Speed of the 40,000-cfm. compressor unit is adjusted to fuel consumption. The compressor discharges at 45 psi. to the regenerator, where the air picks up heat from the turbine exhaust before it passes through two oil-fired combustion chambers where it is heated. —POWER



CRANES FOR CHINA—As part of China's huge proposed hydro development in the Yangtze River Gorge, multiple gantry cranes with a system of equalizing hoist cables are being considered as one way of raising and lowering river ships a distance of 700 ft. — CONSTRUCTION METHODS.

War-Altered Tool Design

Machine tools have undergone nine general types of changes to meet industrial demands for higher production and lower costs

Machine tools, as a result of the war, show these nine general changes:

Higher Speeds: To suit changes in cutting materials, speeds are higher, requiring higher powered motors and/or increased mechanical efficiency in the drive.

Automatic Feeds: Rapid approach, cutting feed, and rapid return are now tied together in automatic feed cycles to reduce noncutting time. Quick traverse may be sandwiched between two or more machining steps in a single machine cycle where interrupted cuts are encountered.

Better Control: Centralized control statoins, predetermined workcycle settings, electronic or motor-generator rectification to permit use of variable speed characteristics of d.c. motors, additional motors for flexibility of control with simpler mechanical drive, coordination of hydraulic (usually feed) circuits with electrical ones.

Increased Flexibility: To obtain high-production savings on small lots, readily convertible single-purpose machines have been developed. Some tools are combined from units such as turning, drilling, or milling heads; others have readily interchanged manual and automatic control.

More Multiple Cuts: Multiple grinding, gear-cutting and broaching are being done. Automatic transfer or multiple-station machines, with a series of tools set up in a line connected by a transfer conveyor, are also being installed, with 20, or more, stations at each of which transfer and location are automatic.

Greater Accuracy: Increased rigidity to reduce deflection and chatter, hardened surfaces, improved lubrication, automatic electric, hydraulic, or pneumatic sizing, micrometer adjustments for tool settings and provision for temperature changes are being built in.

Easier Servicing: Replaceable toolheads, chip conveyors, readily accessible controls, motors, and hydraulic units are all contributing to ease of servicing and maintenance.

Less Down Time: Simplified clamping, quick-acting workholders, and power-operated chucks are being built in.

Increased Safety: Electrical and mechanical interlocks, so loss of air-clamp pressure stops the machine, or inadequate lubricant pressure prevents starting, duplicated start buttons which require both hands, automatic stops for planer tables, and other safety devices are now being built in. —AMERICAN MACHINIST

SWEET POTATO STARCH

From sweet potatoes grown in the vicinity, the U. S. Sugar Corp. plant at Clewiston, Fla., can produce 120 tons of starch a day. The starch is freed from the cells by repeated grinding, and soluble matter is eliminated by solid-bowl, continuous, centrifugal classifiers. Refining centrifugals take the place of conventional tables and settlers, and they have the advantages of hastening separation, requiring less space. After washing, the starch is bleached with sodium hypochlorite. —CHEM. AND MET. ENGRG.

POINT SOURCE OF LIGHT

From a spot of molten zirconium oxide 0.003 in. in diameter, light ten times as brilliant as that from an incandescent filament is generated in a new light source developed by Western Union Telegraph Co. Since all of the rays emanate from practically the same point, the light gives high definition and clarity in motion-picture projectors and photographic enlargers. In microscopes, it permits higher orders of magnification and opens the way to new fields of re-

search. It may even be used as a lensless projector.

The tiny quantity of oxide is held on one of two metal electrodes inside a glass bulb filled with inert gas, and bombardment with ions raises the oxide to melting temperature. Constantly renewing itself, the glowing electrode requires no adjustment, lasts for hundreds of hours, operates quietly, and burns in any position. —BUSINESS WEEK

RUSSIAN COAL FROM DONBAS

The Russian government has completed plans for full exploitation of the 89 billion tons of coal in the Donets Basin (Donbas). 300 new major pits are planned to produce 200 million tons annually, making Donbas the largest coal-producing area in Europe. Of the 1,135 German-destroyed collieries, more than 50% are back in operation, and in two years the prewar level will be reached. The main task is rehabilitation. The U.S.S.R. coal is still far from meeting the needs of its industry, and with the envisaged expansion of the many fuel-absorbing processes, the coal industry must expand at a greater rate than any other in the Soviet. —COAL AGE

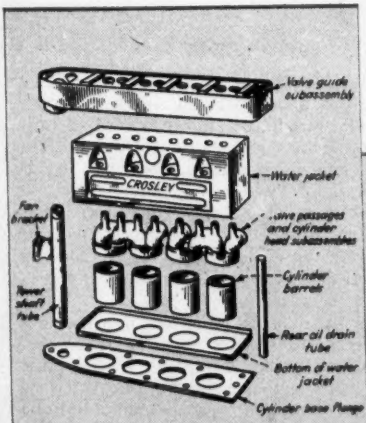
BOMB TELEVISION BECOMES NEWS PICKUP

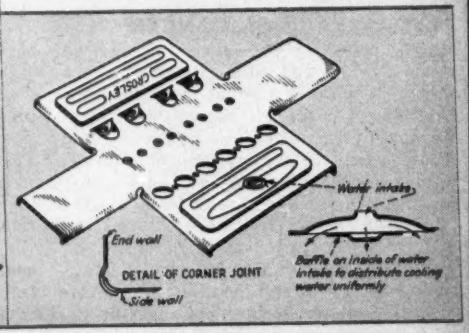
The television camera-transmitter originally built to help guide bombs by remote control has been adapted to on-the-spot television news pickups. A main transmitter beams out synchronizing signals to lock in the signals of the portable unit, which then sends its composite signal back to the main transmitter for broadcasting. The present range is about 15 miles.

Light enough to carry in a suitcase, the unit can be operated by battery if a power line is not available.—ELECTRONICS

NEW FROZEN FOODS

French-fried potatoes—precooked, frozen, and packaged by the Maxson Food System—are ready for the table after 20 minutes in a 400° F. oven. . . . A frozen raw-potato pancake batter which will keep in ordinary refrigeration for 3 to 4 weeks is produced by Louis Milani Foods. . . . Experiments at the University of California show that frozen apple juice and frozen sharp cider have their natural color and flavor after 12 months in storage. —FOOD INDUSTRIES





BRAZED-STEEL BLOCK—The aluminum-body, 4-pass. Crosley, only 145 in. long, 57 in. high and 49 in. wide, has a 26½-hp., 4-cyl., engine with furnace-brazed (2,060 F.) steel cylinder block. About 120 pieces, weighing 14 lb. before machining, make up the unit. Light-walled SAE 4140 steel tubing forms cylinders and cam-follower guides, steel stampings form most other parts. The water jacket (below) is coated with clear baked-on plastic.—PRODUCT ENGINEERING

BETTER PROPELLERS

Efficient use of propellers at airplane speeds well into the sonic range is forecast. A combination of blade-tip sweepback, constant speed, and two-speed engine reduction gearing assures high propeller efficiency. One 3-blade design by NACA has an efficiency of 88% at 530 mph. compared to 60% for the conventional type. It utilizes a thin, wide blade extending directly into the root at 12½% thickness and mounting a large spinner. Special tips with heavy sweepback produce better than 90% efficiencies at even higher speeds.

Propeller designs now being tested can deliver 5 lb. of thrust per hp. at 500 mph. compared to 1.5 lb. for the turbo-jet engine. —AVIATION NEWS

PORTABLE OXYGEN FACTORY

A war-developed, portable, oxygen generator can be broken down into six parts, each weighing less than 3,000 lb, and small enough to be carried in the cargo hatch of a C-46 transport. Ordinary air is liquefied by the unit at nearly -300° F., and the oxygen and nitrogen are vaporized separately. Using a high-speed compression unit which requires no liquid lubricant, an 80% efficient expansion engine operating on 100 lb. air, and eleven miles of extremely thin copper-ribbon heat exchanger, the generator is convenient to install, and it is safe and simple to operate. —CHEM. AND MET. ENGRG.

MASS ATTACK ON CANCER

In the past 25 years cancer has climbed from 7th to 2nd place as a cause of death. The disease is not hereditary nor contagious, although susceptibility may be hereditary. Workers who are in close contact with cotton, paraffin or analine, or who are exposed to the sun a great deal, are more likely to develop cancer. Unknown factors are: what controls the cell growth, what natural defenses the body has, what dietary or virus factors influence cancer, and the relation between cancer and the sex hormones. Wide investigation has produced many promising leads and many new and better tools for research and therapy. Radioactive Carbon 13 can be used as a tracer in investigating life-processes. Radon gas, sealed in tiny pellets and planted in the cancerous growth, is effective. More powerful X-ray machines and a wider choice of radioactive substance will be big weapons in the coming battle.—SCIENCE ILLUSTRATED

FREQUENCY STABILIZER

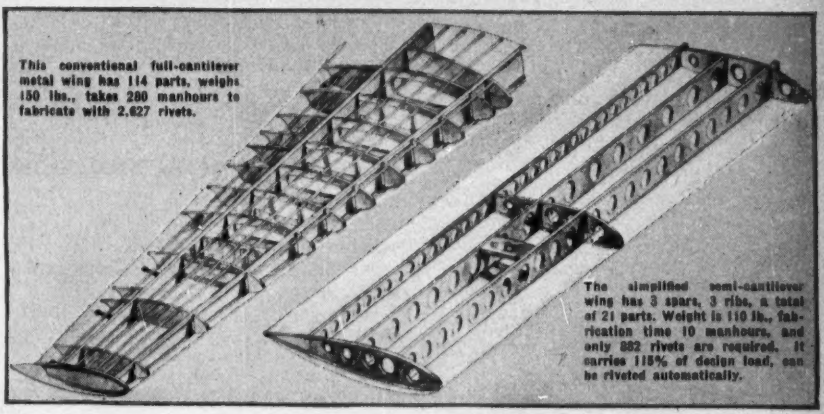
Relatively low-cost automatic correction of frequency shift in electronic heaters can be attained by using an electric motor to keep the oscillator properly tuned by varying the circuit inductance, capacitance, or transmission-line length. One way of doing this is to feed the output from a cyrstal oscillator into a mixer stage along with some voltage picked up from the heating oscillator. The output circuit of the mixer stage passes the difference frequency between the two oscillators, and after amplification this voltage is applied to a diode discriminator whose output controls relays, thyratrons, or vacuum tubes that in turn control the tuning motor. Frequency stability in the order of $\pm 0.05\%$ can be attained. —ELECTRONICS

WEATHER PROFIT

After carefully estimating tomorrow's sales of bakery products in its chain of retail outlets on the basis of detailed weather forecast data, Cushman's Sons, Inc., schedules today's production accordingly.

This leaves little merchandise on the shelves at the end of a day to go stale and become a waste, saving the company about a quarter of a million dollars a year in materials.

A steam utility decides how much of its reserve capacity to bring into operation only after analyzing the Weather Bureau's meteorological data. And a gas company asks a weather scientist when the load will be light enough during three consecutive days so that part of the


This conventional full-cantilever metal wing has 114 parts, weighs 150 lbs., takes 280 manhours to fabricate with 2,627 rivets.
The simplified semi-cantilever wing has 3 spars, 3 ribs, a total of 21 parts. Weight is 110 lb., fabrication time 10 manhours, and only 882 rivets are required. It carries 115% of design load, can be riveted automatically.

equipment can be shut down for servicing.

Weather forecasts relayed to farmers through agricultural agents prevent frost damage to Long Island's million dollar cauliflower crop and blight damage to its potato crop.—BUSINESS WEEK

SYNTHETIC MICA SUPERIOR

An interesting project for the production of synthetic mica has been investigated in the American and British controlled zones in Germany. A typical mix is Al_2O_3, 11.6%; MgO, 32.6%; kieselguhr, 30.7%; K_2SiF_6, 25.1%, but the proportions need not be controlled very accurately. The mix, finely ground and then formed into pellets, is melted in a crucible. The composition of this crucible is not known accurately, but it does not contain any material not found in the pellets. This crucible is supported inside another crucible by fused alumina sand. The entire assembly is heated in a gas-fired furnace to about 1500° C., and then cooled very slowly, avoiding all vibration. The clear mica plates which crystallize out are said to be superior to natural mica in electrical properties as well as being far more uniform and somewhat harder. The cost is about ten times that of natural mica, but this can be reduced considerably.—CHEM. AND MET. ENGRG.

DESIGN SIMPLIFICATION CUTS PLANE COSTS

To cut sales cost of the new Seabee amphibian from $7,500 to less than $4,000, Republic Aviation Corp. simplified design of the airframe structure. Conventional ideas were discarded, reducing tooling cost from $1,750,000 to $400,000, parts three-quarters, fabrication time 92%, while passenger capacity was raised from 3 to 4.

Theory behind the changes was this: Manufacturing costs of a conventional plane are: parts 20%, subassembly 70%, final assembly 10%. Subassembly thus offers the most fertile field for simplification. If *number* of parts is cut 80%, subassembly cost is cut 4/5, thus bringing cost to 14% rather than 70% of total cost. Further, part costs can be cut 80% if parts are redesigned for simple fabrication. This brings manufacturing costs to: parts 4%, subassembly 14%, final assembly 10%, or a total of 28% of the original cost.

Parts were modified in turn on this principle, with the results previously quoted. Improved tooling could pay for itself in 200 airplanes. Original retail cost of $3.60 per lb. was reduced to about $2, airframe cost to $0.50 per lb., 40% for labor. —AMERICAN MACHINIST

MINING A CAVE-IN—Two 10-ton open-end skips are blocked in place on rails under a wooden ramp and grizzly in this cave-in pit. The ore, which includes several feet of shale, is bulldozed to and up the ramp. As each skip is loaded, it is rolled out to be picked up. Two steel towers, a 2½-in. cableway, and a 225-hp. Lidgerwood electric hoist serve to convey the skips to the hopper and washing-plant at pit-side. Seventy-five tons an hour is handled in this way. —ENGRG. AND MINING JOURNAL

BETTER FITTING HOSIERY

About 95% of the knitters produce only one length and width of hosiery. Since this practice may give up to 80% misfits, new standards are being developed by the U. S. Testing Co. More accuracy in size scales is being achieved by replacing the terms "short," "medium," and "long" by specific inch whole number sizes under the headings "A—small," "B—normal," and "C—long," and by putting the knitting specifications on a stable wearing-length basis instead of the unstable boarded length. The number of leg and foot sizes required to guarantee good fitting is based on 10,000 leg measurements. —TEXTILE WORLD

NONFERROUS METAL SITUATION

In Europe, reduced manufacturing capacity, the absence of a free metal market, and governmental control of international trade allow no expectation of a greater volume of trade in the nonferrous metals in the next few years than in the late 1930's. America, responsible for greatly increased production of each metal during the war, must maintain a very high level of consumption (by importing much larger quantities than formerly) if overproduction is to be avoided. There is unlikely to be much new smelter or refinery capacity for nonferrous metals built in Europe in the next few years, and Belgium will probably emerge as the principal European supplier of these metals for the continent of Europe.—ENGRG. & MINING JOURNAL

SUPER-SPEED DRILL

Drilling speed far beyond present practice—8 sec. for a ⅝-in. hole 4 in. deep—is possible with the new Jet drill made by Republic Drill & Tool Co. This performance comes from a new principle of drill design, high spindle speeds and feeds, and the use of a great volume of coolant under high pressure. The drill is equipped with a device that causes the coolant to flow to the bottom of the hole. —MILL SUPPLIES

CONQUERING CHOLERA

Of the various drug combinations tested in the chemotherapy fight against cholera in India, sulfadiazine plus plasma proved most successful, the plasma being used to dilute the thickening blood of the patient. The results proved that no one for whom treatments are available need die of cholera. —SCIENCE ILLUSTRATED

Innovations in Concrete

Wartime developments in design and construction, maintenance, repair, and research disclosed in convention of American Concrete Institute

Observations on the effects of the atomic bombs point to the importance of the period of vibration in the design of reinforced concrete structures. Most of such structural frames proved capable of withstanding the blasts, and chimneys showed an amazing resistance. Fireproof structures capable of withstanding the impact of high explosive missiles are believed to offer satisfactory resistance to blasts from A-bombs.

One percent increase of entrained air in concrete is equivalent to a reduction of 6.4 lb. of water per cu. yd. of concrete. Workability and slump are unchanged if the amount of sand is decreased by about 1% for each percent increase in air, but with the same slump and mix, workability increases with air. Concrete with the same water-cement ratio and aggregate grading suffers about 195-psi. reduction in compressive strength and 105,000-psi. decrease in modulus of elasticity with each percent increase in air.

Resistance to abrasion decreases with air content, with serious effect when there is over 10% air. Freezing and thawing tests on blends of natural and portland cement showed that best results occurred with about 3% air. Increasing the temperature during mixing resulted in reduced entrained air content.

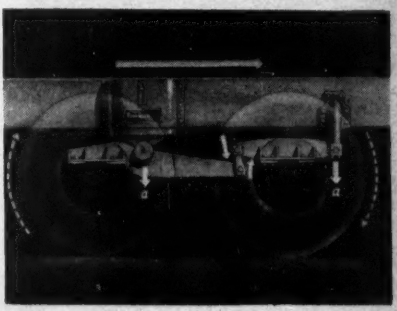
The H-beam and Prepakt method for bridge-pier construction involves carrying the superstructure load on H-beam piles braced by concrete, then enclosing the driven piles by steel-sheet piling and consolidating the tamped aggregate with mortar. This suggests that pneumatic caissons are obsolete, even for deep-water piers.

Thin vertical sections can be precast horizontally, thus eliminating the difficulty of placing concrete in vertical, heavily reinforced walls. Prefabricated concrete structures can compete with other materials for construction, as shown by rigid-frame warehouses and cellular barges composed of thin-shelled open-end boxes.

Methods of restoring and strengthening masonry structures damaged by weather, erosion, and scour of sediment involve: (1) pumping cement-base stabilizing material into small interstices and (2) filling larger spaces by aggregate into which consolidating grout is forced under pressure. —ENGRG. NEWS RECORD

PICTURES FOR CHINA

As part of its general rehabilitation program, China is likely soon to be in the market for motion picture equipment and probably some films. But Chungking will encourage domestic production of educational and morale-building motion pictures to help knit the country more closely together. —BUSINESS WEEK

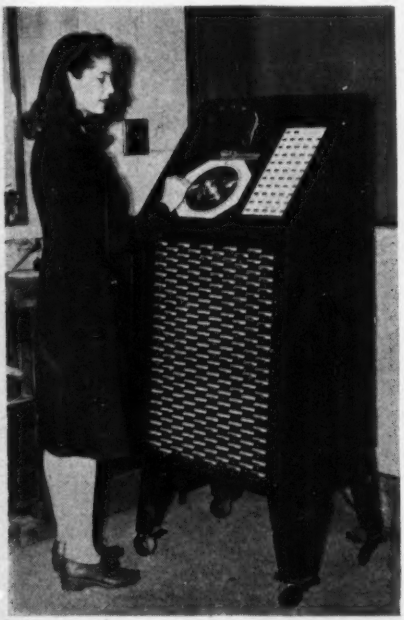


KEEPS WHEELS ON ROAD—With the new type of automotive trailer tandem axle suspension developed by Feather Ride, Inc., the twist in one axle as the brakes are applied opposes that in the other through a bell crank arrangement so that there is a downward force at points (a) to keep all wheels firmly on the ground. Small underload coil springs carry the weight of the trailer when empty and permit main coil springs to be proportioned for load conditions. Rubber mountings allow some axle shift on turns to reduce tire wear. —BUSINESS WEEK

PREPACKAGING PERISHABLES

If perishable fruits and vegetables can be prepared for sale immediately after harvesting, if processed, packaged and stored under conditions that will prevent moisture losses and retard metabolic processes, then the consumer will receive food that is fresher, better-flavored, more sanitary, of higher vitamin content. Many organizations are working on this problem of prepackaging because the extra expense will be more than balanced by the longer life (up to 15 days) of the produce, the increased sales appeal (cellophane wrapped, crisp and cool) and decreased handling in retail stores.

It is anticipated that the packaging will be done at the farm or in central warehouses where the produce is ripened, and this will mean an extensive program to make the farmer or the farmer cooperatives familiar with the packaging technic. However, a greater variety and greater quantity of sales will be possible. Much work remains to be done to determine the best container material for each product. The refrigeration of the retail display cases is another problem. The most desirable temperature, 40° F., is not easy to maintain in the cases, and it frequently causes moisture condensation. —FOOD INDUSTRIES



MACHINE PRINTS RR TICKETS—Installed in a Philadelphia station by the Pennsylvania Railroad Co., an electrically operated machine prints tickets instantly from blank stock as patrons ask for them for any one of 250 destinations. Fifty cities are permanently listed by name on an indicator at the top of the machine. The other 200 are carried in individual matrix card forms in a rack. Pressure on the indicator bar prints a ticket for the city to which the bar points. When a matrix is inserted in a slot, the indicator is turned to "miscellaneous" to print the ticket. —BUS TRANSPORTATION

NEW MOLD STRAIN DOUBLES PENICILLIN OUTPUT

Substantial increase in the world's supply of penicillin is promised by the discovery at the University of Wisconsin of a new mold, Q-176, which has consistently produced twice as much penicillin as X-1612, its commercial predecessor. Cultures of the new strain have been sent to England and Canada, where the antibiotic already is being manufactured, and to France, China, Holland, and Denmark, where new plants have been established or are contemplated.

But Dr. Hans Molitor, of Merk Institute of Therapeutic Research, predicts that penicillin, as well as streptomycin, may lose much of its effectiveness in 5 to 10 years as a result of too widespread use. —BUSINESS WEEK

AIR GUN STRINGS LINE

Stringing of power transmission lines has been speeded by an air gun which shoots a projectile, to which a string is attached, across deep wooded ravines, the string being utilized to pull a small steel wire across, and this, in turn, to pull the line conductors. A length of 1-in. conduit serves as the gun barrel, and 300-psi. air in a portable tank as the propellant. —ELECTRICAL WORLD

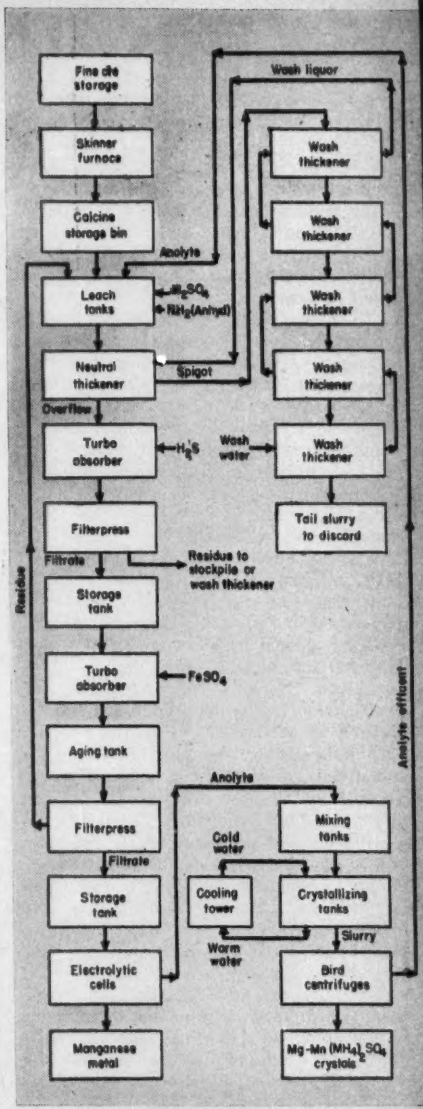
WORSTEDS ON COTTON FRAMES

The use of long-draft cotton machinery for spinning worsted yarns offers unusual possibilities. Apparently the fabric produced is stronger and more even than Bradford or French-spun yarns. When used in a single filling cloth, the appearance is improved and burling costs reduced. Because of the *static* developed, oil-combed tops weighing 50 grs. per yard are used. Since tops are not obtainable commercially at this weight, one gilling or reducing operation is necessary before drawing. Better fiber control makes higher drafts possible.

A comparison of this method with the Bradford system shows that it effects a considerable saving in time and labor. Higher speeds are achieved by reason of less end breakage, better fiber control, and by the use of smaller rings. The principal limitation of the system is fiber length. —TEXTILE WORLD

BAD ORE—GOOD MANGANESE

It is now economically feasible to produce from low-grade domestic ores a high-purity (98.5 to 99.9%) manganese metal, acceptable to the steel and alloy industries, by an electrolytic process developed in a pilot plant by the U. S. Bureau of Mines. Ores with metal content as low as 10.6% have been processed, and it is believed that total production costs of a commercial plant can be held down to 7.5¢ a pound of metal. The ore is crushed and ground to minus 48-mesh in a thermal ball mill, roasted at 700-750° C. in a Skinner furnace, and leached with spent electrolyte from the cells. Sulphuric acid is added as required. The impurities are precipitated as sulphides by H_2S, and the colloidal material is removed by the addition of ferrous sulphate, followed by oxidation and filtering. The manganese is precipitated in lead-lined wooden electrolytic cells with perforated lead anodes and stainless steel cathodes. It is chipped from the cathodes, and is shipped in metal containers.—CHEM. & MET. ENGRG.



Flowsheet of manganese process.

New Facts About Feeding

Wartime experiences contributed much knowledge to the science of nutrition as applied to the masses. Value of dark bread now recognized

Wartime nutritional experiences in European countries indicate that the adult body adjusts itself to a lower metabolic level. People were able to get along fairly well on daily intakes of 1,600 to 2,000 calories after losing 15 to 20% of their weight.

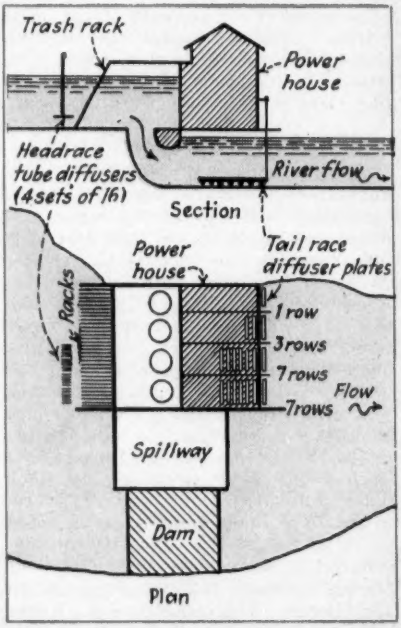
In a nutrition study at Cambridge, volunteers lived for many weeks on a diet consisting largely of potatoes, vegetables, and 92% extraction bread. It was a formidable task to eat the bulky meals necessary to provide the calorie requirements, but the volunteers did hard work without undue fatigue or discomfort.

The merits of a nutritious form of dark bread are far more widely recognized today than before the war. In Britain, the use of 85% extraction flour enriched with calcium carbonate at once dispelled any trace of the prewar thiamin deficiency and raised the calcium intake to 180 mg. daily. In addition, it materially improved the intake of riboflavin, niacin, and iron. Some authorities credit this iron-rich flour with reducing the incidence of anemia.

The health of the people in England remained satisfactory through the war in spite of the low protein and fat diet, and vitamin deficiency rarely is encountered. So that country is retaining many of the food regulations introduced under the wartime nutritional plan. White flour of the type consumed prewar will not be used again. School children will be given free milk and a hot midday meal.

Low protein and fat diets, however, result in unappetizing meals, introducing a psychological factor no less important than nutritional considerations because of the depressing effect.

The treatment of severe cases of starvation has been changed as a result of new knowledge gained by experience in the liberated countries. The use of protein hydrolysates, or predigested protein, is not necessary because patients in almost the last stages of collapse can take separated milk—first in sips, soon in large quantities—and digest it. High protein and calorie intakes are unnecessary to effect rapid recovery from the effects of starvation.—FOOD INDUSTRIES



OXYGEN CURES POLLUTION—Reaeration by air diffusion in headrace and tailrace of power plant accelerates recovery from the effect of sulphite paper waste pollution in Wisconsin. A compressor located in the generator room furnishes 1,360 to 1,550 cu. ft. of air per minute in the pressure range of 5 to 15 psi. There are no adverse effects on the turbines. —ENGRS. NEWS-RECORD

TURBOJET BLADES FORGED BY CONTROLLED PROCESS

High-alloy rotor and compressor blades for gas turbines and jet engines can be forged rapidly to tolerances of less than 0.002 in. by carefully controlled heating and atmospheres, together with accurate timing of each operation, in a process developed by Utica Drop Forge & Tool Co. Rough forging of previously upset bar stock is done in a 600-ton high-speed press to which the parts are supplied on a close time schedule from a rotary-hearth, controlled-atmosphere electric furnace. Time scheduling prevents variations in cooling during progress of the work, and the die lubricant and coolant are automatically fed and regulated to give a constant working temperature. The dies for the press, as well as those in the drop hammer used for finish-sizing and refining of the metal grain structure, are equipped with bumper blocks at sides to insure precision without time-consuming adjustments.

To permit all heat cycles to be repeated with accuracy or altered with certainty, recorders chart the atmosphere and heat of each furnace. The operator of the remote furnace controls works from charts. —AVIATION

MEXICAN EXPERIMENT IN EMPLOYEE RELATIONS

Designed to be a complete industrial community, the New Mexico City plant project of Distribuidora Mexicana will include factory buildings, apartments for the employees and their families, and complete urban facilities, all within a single enclosure on the outskirts of the city. The project will include a school, theater, gymnasium, hospital, laundry, stores, dining room, library, stadium, swimming pool, gardens, and its own sources of water, light, and power. The wages in the old plant will be continued, but in addition the workers will receive housing, medical care, and all of the advantages of the community without charge. It is hoped that the consuming capacity of the workers will be stimulated, a development needed in Mexico, where an estimated one-third, or less, of the population now consumes manufactured goods. —FACTORY

WASTED EFFORT—Light bulbs attached to the model's hands reveal to the camera much waste movement. Here is a "simple" operation of putting on a hat. Methods like this can be used by engineers to make motion studies of factory jobs. —SCIENCE ILLUSTRATED

FLUORESCENT HORTICULTURE

Using two ordinary 40-watt fluorescent lamps, in a 3x3x6 ft. cabinet, home gardeners can propagate cuttings and seedlings in basements or storage rooms. White or pink lamps produce more rapid and heavier rootings than the daylight type. But a light richer in the blue-violet rays has been found best for growing seedlings. —ELECTRICAL WORLD

BUTADIENE COST CUT

In a pilot plant which utilizes a refinement of the Schoch process, butadiene has been produced for 9½¢ a lb., reported to be about one-half the cost for previous methods. Dr. E. P. Schoch, chemical engineer and research man for the University of Texas, describes the process as one which will produce acetylene from methane gas by means of an electrical discharge. —ELECTRICAL WORLD

TECHNICAL SHORTS

Rough Rails Unload Cars—The unloading of bottom-dump mine cars at Kimberly, Nev., is facilitated by corrugated rails installed at the ore pockets to jar the cars. The locomotives travel on parallel sets of smooth rails. —ENGRG. AND MINING JOURNAL

Blows Huts Down—To dismantle corrugated-sheet-covered Quonset huts without drawing nails, individually, the Navy is reported to batten inside doors and windows, then set off a charge of dynamite to blow the sheets off without damage. —AMERICAN MACHINIST

For Want of a Nail—When the Navy discovered that breakage of wooden nail kegs during shipment was resulting in losses up to 20%, a shift was made to 24-gage welded sheet steel drums with crimped or bolted top end and double-crimped lower end. Rolling hoops were provided near the ends of the drums. —THE WELDING ENGINEER

TILT-UP CONSTRUCTION—Concrete wall panels were precast horizontally, tilted up into position and braced until wall columns were cast in a St. Cloud, Minn., construction job, the lifting rig taking the strain. The projecting reinforcing bars act as dowels into the columns between panels. The cost saving amounted to about $2,000, or 30c a sq. ft. of floor area. More than 1,000 applications indicate wide possibilities. —CONSTRUCTION METHODS

Gas Burners Better—American Gas Ass'n has developed the "100% primary air burner," which draws through an adjustable shutter all the air needed for combustion, preventing secondary combustion. Flames are short and bright, producing efficient heating without blowers or high gas pressures. In appliances, the burner eliminates aeration bowls, widely spaced burner parts, and other mechanisms. The burner nearly contacts the utensil bottom. —PRODUCT ENGINEERING

Hot Journal Alarm—If an axle journal overheats on a New York Central System railway passenger car, smoke and an odorous gas are discharged from two cylinders set into the journal. One cylinder contains liquid ethyl mercaptan to generate the smoke. The other holds a liquid combination of titanium tetrachloride and carbon tetrachloride to develop a penetrating odor. —BUSINESS WEEK

50-ft. Light Beam Controls Mandrel—Regardless of where he is working along the 50-ft. length of the rotating mandrel used in making heavy hose at Hewitt Rubber Corp., the operator can stop the machine instantly merely by moving his foot forward. That motion breaks a light beam projected from one end of the mandrel to a photocell at the other, 12 in. off the floor. —ELECTRONICS

Sprayed Radio Circuit—Through cutouts in a mask, channels are sandblasted into a plastic radio chassis and metal is sprayed into the channels to form the circuit in a process developed by Promenette Radio & Television Corp. A tenfold production rate and lower maintenance cost are the advantages. —BUSINESS WEEK

Betatron a Practical Tool—Metal sections varying widely in thickness can be radiographed in industry with the 20,000,000 electron-volt betatron. And the size of its x-ray source approximates a point, permitting enlargement of the specimen in the radiograph simply by increasing the specimen-to-film distance. —ELECTRONICS

Stains in Masonry—Surface washings from metal and timbers, fumes, iron compounds in mortar sand, rust dissolved by water containing carbon dioxide, and foreign materials behind stone-facings are some of the causes of masonry stains. Natural limestone may be self-staining. Recommended: thicker stone facings, bituminous backings, regular cleaning with plain water. —ENG. NEWS RECORD

Stabilized Rayon—Rayon fabrics can be stabilized, without preshrinking, by a Sylvania Industrial Corp. process in which the fabric is padded with an alkali-soluble, water-insoluble, cellulose ether which is coagulated to form a tough film around each fiber in the textile and fix the position of the yarns. —TEXTILE WORLD

Mine Safety Technic—To open a circuit breaker before a mine-roof fall can break a nearby trolley wire and cause a dangerous short-circuit, a fragile insulated pilot wire is hung on a line of insulators paralleling the trolley-wire. Broken by the fall, the wire opens the circuit breaker. —COAL AGE

Better Animal Glue—Animal glue is now fortified against mold and extraneous bacteria by the addition of an organic mercury fungicide-bactericide to extend the life of wood products used in humid climates. Before wood joints are put together with the glue, one side is treated with a dilute formaldehyde solution which imparts full moisure resistance. —CHEM. AND MET. ENGRG.

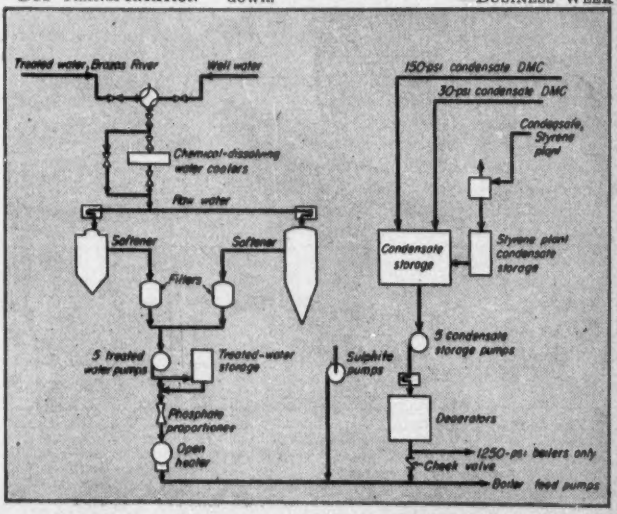
Bus Bodies Die-formed—Using a die-forming process developed in the aircraft industry, ACF-Brill Motors Co. is shaping aluminum sheets into bus body sections with complex contours by means of Kirksite dies. Suitable for medium-run production, the dies are made from plaster casts of the components of each body panel on a mock-up of the bus, these serving as patterns in casting the dies in sand molds. —BUS TRANSPORTATION

Levee Breaks Closed—A highly efficient method of closing breaks in levees on tidal rivers in California employs the reversal of tidal flow through the break to build up shoals that reduce the opening. At slack water, a double row of piles is driven, to act as a guide for the brush bundles, rock, and sand. —ENGRG. NEWS RECORD

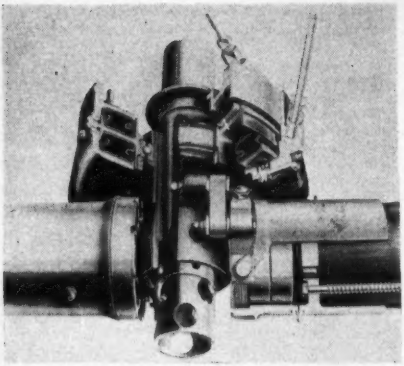
Improvement in Amplifiers—Radio-frequency power amplifiers using grounded-grid circuits operate at higher frequencies and can handle wider band widths than capacitance-neutralized, grounded-cathode circuits. These advantages suit the grounded-grid circuit to television, f-m, and industrial uses, and the novel circuit is destined to be used widely in the high frequency field. —ELECTRONICS

New Pectin Saves Sugar—Candy manufacturers are greatly interested in a new modified pectin jelly which has the taste, texture, and appearance of the finest-quality cream centers but requires only half as much sugar. It was developed by the Western Regional Research Lab. from pectin in citrus peel by the action of an enzyme also occurring in citrus peel. —FOOD INDUSTRIES

New-Type Paper Condenser—Condensers for electronic equipment are made by applying a vaporized zinc coating directly to the paper dielectric with a machine developed by the German Robert Bosh Co. The capacitor is 40% smaller than a paper and foil unit, operates at 20 to 50% higher voltages, and heals automatically after electrical breakdown. —BUSINESS WEEK



DUAL WATER SUPPLY—The Velasco, Tex., plant of Dow Magnesium originally operated with almost 100% condensate return, so a 100,000-lb. per hr. water softener was large enough. However, addition of a 50,000-ton per year styrene plant nearby required this water-treatment setup, with an additional 400,000-lb. per hr. softener to assure 500,000-lb. per hr. process-steam supply in addition to power requirements. The storage-tank system serves as a cushion against changes in operating demand. —POWER



PROPELLER-PITCH ADJUSTER—Take-off run is decreased 20%, rate of climb increased 27% for a light airplane equipped with the new two-position hydraulic-control propeller of Continental Aviation & Engineering Corp. Cutaway drawing shows flexible expander rings which are actuated by engine oil pressure to move a sliding collar that changes blade pitch through a linkage. The control is a four-way valve. —AVIATION NEWS

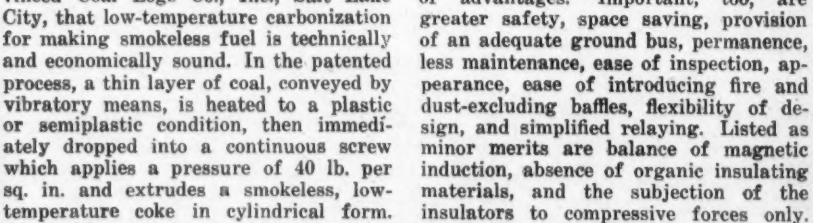
COAL LOGS IN PRODUCTION

Extensive pilot plant tests have convinced Coal Logs Co., Inc., Salt Lake City, that low-temperature carbonization for making smokeless fuel is technically and economically sound. In the patented process, a thin layer of coal, conveyed by vibratory means, is heated to a plastic or semiplastic condition, then immediately dropped into a continuous screw which applies a pressure of 40 lb. per sq. in. and extrudes a smokeless, low-temperature coke in cylindrical form. The finished product can be in briquette or granular form.

The significant feature is the progressive distillation in which the volatiles are removed (through air-cooled ducts) continuously, at the volatilization temperature of each major fraction. Advantages are (1) high speed of production, (2) simple, automatic, continuous, flexible operation, (3) adaptability to any coal, (4) number and purity of volatile fractions easily obtained, (5) size, density, and characteristics of fuel products are easily controlled. Estimated cost per ton of coal is 18-25% of that using other methods. —CHEM & MET. ENGRG.

ISOLATED-PHASE BUS FAVORED IN POWER PLANTS

There is somewhat of a trend toward the use of the isolated-phase bus in electrical power plants to attain a high continuity of service and eliminate short circuits between phases. The readiness with which installations can be made and with which this type of bus can be accommodated to the housing of equipment terminals comes next in its list of advantages. Important, too, are greater safety, space saving, provision of an adequate ground bus, permanence, less maintenance, ease of inspection, appearance, ease of introducing fire and dust-excluding baffles, flexibility of design, and simplified relaying. Listed as minor merits are balance of magnetic induction, absence of organic insulating materials, and the subjection of the insulators to compressive forces only. There has been adverse experience with dust infiltration. —ELECTRICAL WORLD



MAKES BLOCKS FROM RUBBLE—A "machinery-train" is at work in the ruins of European cities, rebuilding livable dwellings. Using the rubble of war-wrecked stone and brick structures as aggregate for concrete blocks, the train is capable of producing, in one 8-hour day, materials sufficient for two one-family houses. Consisting of a crusher, an elevated classifier and storage bin, a concrete mixer, a vibrating block machine, and a curing section, the train can be operated with a minimum of skill. Buildings are easily made from the blocks. —ENGRG. NEWS-RECORD

House Lighting of Future

More than a dozen new practical ideas in residential lighting technics, designed for illumination and psychological effects

Inbuilt residential lighting is a fertile field awaiting aggressive industry development of ideas such as these:

Center Dome Light—Center of living room is accented with cheerfulness with a soft glow of light from an indirectly lighted coffer. Circular cold cathode tubing in this coffer is of proper color to blend with furnishings in the room.

Illuminated Mantel — A continuous fluorescent tube is concealed in the mantel over fireplace in the living room. A panel of clear plastic containing closely spaced louvers shields the lamp from persons standing in the room. Ornaments placed on the mantel are lighted softly, and a pleasant indirect lighting effect on the ceiling over the mantel results. Windows on each side of fireplace are lighted with fluorescent lamps concealed in a valance lighting unit. Light is spilled on the drapes below the valance, as well as on the wall and ceiling above, creating a comfortable indirect lighting effect.

Reverse Cove—A reverse cove in the suspended ceiling lights the rear wall and window end of the living room. Long slim fluorescent lamps permit a shallow cove and flexibility in lighting result. Amber lamps over windows and white lamps over rear wall create an illusion of sunlight in winter. A change of lamps in summer permits cool effect from daylight type lamps.

Center Ceiling Light—The center dome in the dining room provides indirect lighting from two curved fluorescent tubes, one soft white and the other 3500° white, which supplements the indirect lighting from the side wall lighting troughs. It also conceals a pinhole spotlight used to highlight the table.

Cabinet—The dining room wall next to the kitchen contains a built-in glass-shelf cabinet, with mirror backwall. This cabinet is lighted from both top and bottom by white fluorescent lamps. Overhead lamp is concealed behind a wide panel of plastic containing closely spaced louvers. The light from the bottom lamp shines up through the glass shelves, and also down on the table top over the bottom cabinet drawers.

Glass Block Window—Glass blocks are lighted from outside to simulate sunlight. Amber fluorescent lamps are used in mat finished reflectors, concealed in a metal or asbestos lined cabinet. A fluorescent lamp in a polished reflector in trough recess at top provides work light, or supplementary decorative lighting effect.

Side Panel Cove Lighting—An architectural band on each side wall of the dining room forms part of the decorative motif, and conceals an indirect lighting cove. Two decorative luminous plaques are located in this band on each side wall. Made of glass or plastic, with polished clear edges and etched decoration, these plaques are softly illuminated by a small fluorescent lamp located below each ornament. The bottom of the band is closed. Long slim lamps are used in the top reflector to provide soft general illumination in the room. This reflector is open above each luminous plaque, to add some light from above.

Recreation Room Light—Recreation room in basement is lighted with continuous troughs containing long slim lamps, installed flush in ceiling. Flashed opal glass panels with exposed surface satin finish conceals lamps, diffuses the light, and prevents reflection of lamps from indirect floor and table lamps used for indirect lighting. These troughs provide high level lighting for games.

Flush Light Over Sink—A two-lamp fixture, equipped with 4500° white fluor-

escent lamps, is installed flush over the kitchen sink, and louvered, to provide shielded high intensity light of good color quality for this work area.

Cabinet Light — High-level illumination of good color quality is provided for work areas in the kitchen by 4500° white fluorescent lamps installed underneath the overhead cabinets. Electric service for toasters, mixers, percolators, and other kitchen appliances is readily available from convenience outlets installed every six inches in the wireway located on the wall above the table top.

Vanity Lighting—The dressing table in the bedroom is effectively self-illuminated from two luminous panels built into the three-panel mirror. Soft white fluorescent lamps are concealed in reflectors behind diffusing glass panels which provide long sources of light from two directions.

Night Light—The night lights are installed at strategic points throughout the house as a safety against accidents. The unit recesses flush in the wall, is shielded by angled louvers, and uses a small 7½-watt incandescent lamp.

Lighted Terrace Bench—On opposite side of the terrace from the house, and flanking the entrance walkway, is a low wall which may be used as a seat. Concealed underneath is a slimline lamp, which provides a soft glow of light on the terrace and on the front of the house, making the terrace an ideal spot for summer evenings.

Step Light—The front door contains a recessed light underneath the entrance step, which floods the walkway with light. A 13-watt fluorescent lamp provides the light, which is shielded from above by louvered plastic, installed behind clear glass.

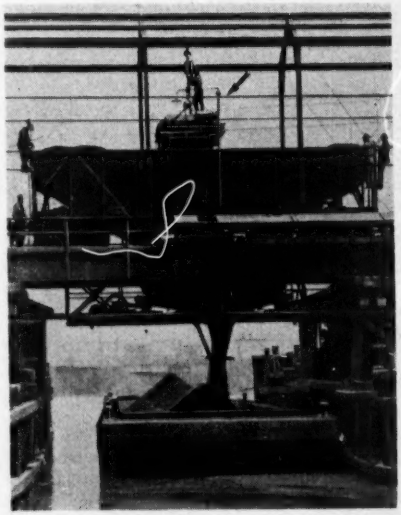
Illuminated Mirror — The circular make-up or shaving mirror in the guest bathroom is appropriately lighted with a circline lamp, concealed behind a luminous shield. The reflection of glareless light evenly from a face-framing circle completely eliminates shadow while shaving. —ELECTRICAL CONTRACTING

DENATURED PLUTONIUM SUGGESTED FOR POWER PLANTS

Reporting to the State Department on the possibilities of international control of atomic energy, a board of consultants proposed an Atomic Development Authority which would:

1. Own all known sources of uranium and thorium.
2. Conduct all mining and preparation of these minerals.
3. Conduct all preparation of the two metals.
4. Operate all piles producing fissionable materials.
5. Denature, stock pile, and base all fissionable products.
6. Maintain adequate supervision, inspection, and auditing experts to assure compliance with its regulations.
7. Maintain itself through research and development as the foremost source of information on atomic energy in the world.

First lay knowledge of the possibility of so adulterating plutonium as to make



SHAKES LOAD OUT OF CAR—A huge shaker which unloads a hopper-bottomed coal car in 2 min. has been developed by Robins Conveyors, Inc. Placed on top of the car and operated by an electric motor, it gives a seismic action to the car and the load flows rapidly. It is operated by two men. By usual methods, 4 to 6 men require two hours per car. —CHEM. & MET. ENGRG.

it useful for nonexplosive applications while removing its explosive properties came from this report.

While it is possible to remove the denaturant from plutonium, as well as from U-235, it would be a large effort calling for rather complex installations, and scientific and engineering skill of an appreciable order.

Production of electric power through the use of a nuclear reaction operating on denatured plutonium would be available to private enterprise, and the board of experts sees no significant limitations of this power development, either in the availability or in the cost of the fundamental materials. —ELECTRICAL WORLD

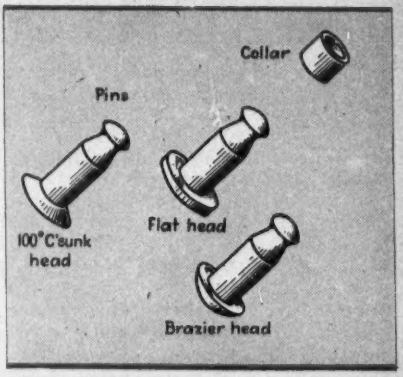
NEW POTATO BREAD

A culture containing potato flour, corn flour, dry yeast and 13 undisclosed other ingredients, improves bread, as shown by phenomenal sales increase and the adoption of the process by more than 60 bakers nationally. The culture, prepared wet and reduced to powder on a hot, rotating-drum dryer, is mixed with the other dry bread ingredients to the extent of 3% by weight. From then on the baking is orthodox. Mold and rope do not develop quickly in the new "potato bread", and the product has a distinctive flavor, as well as good crumb and crust texture. —FOOD INDUSTRIES

TALL FACTORIES COST MORE

On the average, the cost of an industrial plant building increases with the height. Assuming the same total floor space in each case, the comparative costs, per square foot, would be: $4 for 1 story, $4.20 for 2 stories, $4.40 for 3 stories, $4.60 for 4 stories, and $4.80 for 5 stories. These figures include installation of lighting, heating, plumbing, and sprinklers.

But the decisive factor in determining whether to build a single or multi-story factory is the processing method employed. There is no sound general argument in favor of or against either type of structure. —FACTORY



SHEAR-LOAD RIVETS—Consisting of a heat-treated, cadmium-plated, steel pin in 3 shapes and an aluminum-alloy collar, the "Hi-Shear" rivet was developed for applications where shear loads are large and tensile loads small. First applications are in aircraft structures to replace bolts or usual rivets. A special tool forces the collar into the circumferential groove near the rivet end, shearing off excess collar material and giving a conical head beneath the rivet button end. Heat-treated to 125,000-150,000 psi., the rivet has shear strength of 75,000 psi. It can be driven with pneumatic guns or squeezers. —PRODUCT ENGINEERING

PREFABRICATES HOUSE SHELLS

The John A. Johnson Contracting Corp. is turning out precision-built, shop-assembled panels for complete shells (frame, exterior, inclosure, and flooring) of several models of one-story, single-family houses. With shiplap or shingle siding, and shingled gables (including rake cornices and louvre frames), the 4-room model uses 8,200 f.b.m. of lumber. The houses are produced 30 to 50 per day, and time of erection is 6 days with 5 carpenters. —CONSTRUCTION METHODS

SUPERCHARGER EJECTOR

By constructing the shroud around an aircraft engine turbosupercharger exhaust pipe in such a way that the exhaust discharge acts on the ejector principle to pull air through the space between the exhaust pipe and the shroud, leakage of hot air into the nacelle is avoided and the fire hazard reduced. In addition, supercharger cooling is improved. —AVIATION

There Is No Defense

In the opinion of leading atomic energy authorities there is no physical defense against the atomic bomb. International control is only answer

In a report to the public on the full meaning of the atomic bomb, some outstanding scientists associated with the project, and other top authorities, describe the situation as the most dangerous that humanity has faced in all history. The cost of destruction has been vastly reduced, and the power of destruction tremendously increased. (A typewriter-size box could "contain an instrument of enough power to wreck the Panama Canal.") Thus there has been a profound change in the balance between national and international interests, and the need for world-awareness of the hazards is urgent.

Defense against airborne atomic explosives would involve detection, identification, course prediction, and interception, each presenting difficulties of such magnitude that the conclusion is reached that "there is no such thing as a specific countermeasure." The necessarily inefficient initial defense, such as at Pearl Harbor and against V-1, the buss-bombs and air-raids, would this time be not merely tragic, it would be fatal. Attempting to guard against sabotage would involve such elaborate schemes for inspection and investigation that all personal liberty would be severely curtailed, and still such methods would be inadequate to prevent destruction of a nation's nerve-centers by a handful of desperate men.

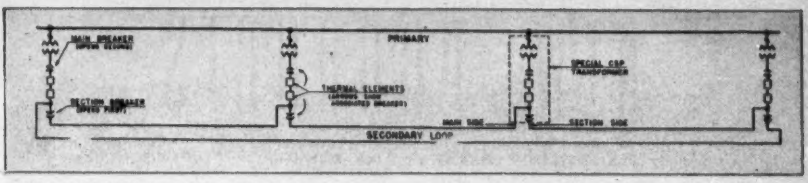
The winner of the atomic armament race would be in no way safe or secure, because once a nation possesses a certain minimum number of bombs there is no great advantage in having more. If any nation had sufficient bombs to destroy all military targets, in what way could another nation keep ahead of it? It is impossible to kill people twice. To attempt to dominate all other nations would be utterly futile, and would wreck our lives and those of generations to come.

To disperse our cities and to take our civilization underground would temporarily reduce the efficiency of atomic bombs, but would provide no permanent defense, because the larger bombs which will be made will destroy our economy and our property just the same. Neither moral sanction nor fear of retaliation has ever been a deterrent to the use of weapons, no matter how terrible.

Thus, all defenses, known or foreseeable, are nearly useless and completely ineffective. No military defense exists and none can be devised. There will be no use in firing even the best imaginable antiaircraft at the missiles that might be the harbingers of a new atomic war.

Collective efforts will require a very real renunciation of the steps by which, in the past, national security has been sought. If mankind is to control atomic energy, the rules agreed upon must become the supreme law in all lands, and all previous and subsequent national laws

ENGINE BETWEEN ROTORS—The newly developed single-place Roteron helicopter has two coaxial rotors with a 5-cyl. 25-hp. radial engine mounted between them. The engine shaft, driven through a 2:1 planetary speed-reduction gear, is fixed to the upper rotor, the engine case to the lower one. The torque of the upper rotor causes the engine case to revolve and counter-rotate the lower rotor, a rudder offsetting any torque caused by friction in the rotor assemblies. The Roteron has a small top rotor, permitting a lighter reduction gear to be employed. —AVIATION



POWER DISTRIBUTION ECONOMY—Using banked-secondary transformers incorporating a special protective scheme, savings run from 5% to 35% of installed transformer capacity. The basic idea is to allow the transformers to carry large but safe overloads as long as possible and at the same time provide a secondary fault-isolating and load-dropping arrangement causing a minimum of disturbance to the other parts of the secondary bank. Two circuit breakers, designated as main and section, are built into the transformer on the secondary side. Each breaker is actuated by a bimetal control which responds to load current and transformer-oil temperature. The section breaker is calibrated to open first, the main breaker to trip at the same values as the single breaker in a standard CSP transformer. Protective links clear the transformer in event of an internal fault. —ELECTRICAL WEST

must conform to this world law. If a step-by-step process finally brings the visioned effective control, we may someday come to regard the atomic bomb as the discovery that made it possible for mankind to bring an end to all war. —("One World or None") McGraw-Hill Book Co., Inc.

ELECTRONIC EXCITER USED ON 81,250-KVA. ALTERNATOR

Extended use of ignitron rectifiers in recent years has established them as a reliable and efficient means of converting a.c. to d.c. And now one has been installed on a 81,250-kva., 3,600 rpm. turbo-alternator so isolated electrically that a shut-down would be very costly.

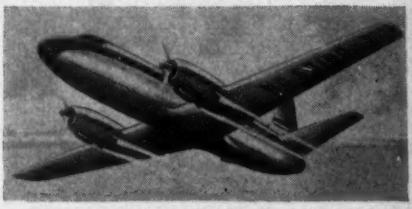
The electronic exciter consists fundamentally of a rectifier transformer, a power rectifier, and a voltage regulating circuit. It can be maintained while in service, has an inherent high speed of response, and is reliable but it costs more. —ELECTRICAL WORLD

STABILIZED CANALS

Using methods similar to those for soil compaction in highway and airport work, the U. S. Bureau of Reclamation is investigating the practicability of lining irrigation canals with earth stabilized by Portland cement and a resin compound. This type of lining, if found successful, would be cheaper than concrete, and of special value in preventing seepage in sandy soils. —ENGRG. NEWS RECORD

PLANES TO BE SEEN

To sell for the low price of $1,320, the two-place Ross *Sport Plane* is powered by a 65-hp. Lycoming engine, has a 30-ft. parasol-type wing, weighs but 555 lb., cruises at 90 mph., consumes 3.8 gal. of fuel an hour, and has a service ceiling of 14,000 ft. . . . A 4-place roadable airplane designed to tow its detachable wing and tail assembly down the highway in trailer form is under development in California . . . Priced at $6,100, the 185-hp. four-place *Navion* developed by North American Aviation, Inc., has the appointments of a luxurious automobile, cruises at 150 mph., lands at 54 mph. and has a 700-mile range. For good aileron control at low speeds, the wing tip is inclined 3° relative to the root airfoil, and the tip airfoil section has a large camber. . . . Canadian *BX Moth* 4-place biplane hauls 500 lb. of freight 375 mi. on 25 gal. of fuel. —AVIATION NEWS



PROPELLER - JET TRANSPORT—In the first departure from conventional power in commercial transports, United Air Lines has ordered an airliner equipped with two combination propeller-jet engines. It is to cruise at 365 mph. with 40 passengers, and is expected to permit an 8-hr. coast-to-coast schedule with two stops.—AVIATION NEWS

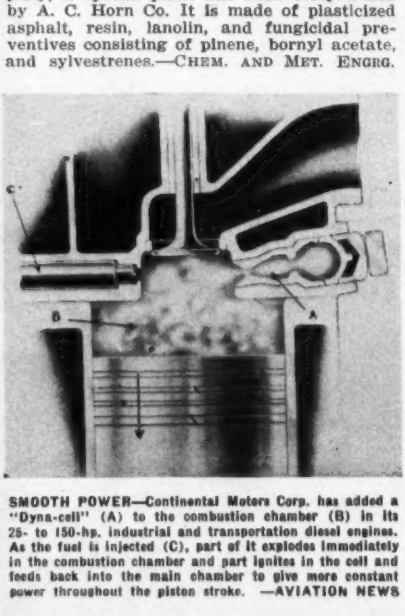
NEW PRODUCTS

Penicillin Chewing Gum—Paraffin-base chewing troches containing 25,000 units of penicillin each are now made by E. R. Squibb & Sons as a treatment for trench mouth. Navy doctors recently reported favorably on the use of penicillin for trench mouth in 400 cases. —BUSINESS WEEK

Alkaline Ink—A new ammoniacal type of ink, which makes permanent records with little or no deteriorative effects on the paper, has been produced by the National Bureau of Standards. It is not yet available commercially. —CHEM. AND MET. ENGRG.

Cold-starting Fuel—By feeding a special Texas Co. fuel, made of low-boiling-point fractions, to an aircraft motor for about 2 minutes, preheating in cold weather is eliminated. —AIR TRANSPORT

Tree Paint—To heal tree wounds more rapidly, a special paint has been compounded by A. C. Horn Co. It is made of plasticized asphalt, resin, lanolin, and fungicidal preventives consisting of pinene, bornyl acetate, and sylvestrenes.—CHEM. AND MET. ENGRG.



SMOOTH POWER—Continental Motors Corp. has added a "Dyna-cell" (A) to the combustion chamber (B) in its 25- to 150-hp. industrial and transportation diesel engines. As the fuel is injected (C), part of it explodes immediately in the combustion chamber and part ignites in the cell and feeds back into the main chamber to give more constant power throughout the piston stroke. —AVIATION NEWS

Flaw Catcher—A hypersonic analyzer, said to be able to detect any change of density, has definite possibilities in the metals and plastics fields, particularly where materials have a constant cross-section. Produced by Brush Development Co., it will detect pipes, cat's eyes, blisters, and laminations early in the rolling of steel. —ENGRG. NEWS RECORD

Remote Positioner—The position of an instrument pointer can be duplicated and industrial devices may be controlled remotely by a transmitter and receiver developed by Allis-Chalmers Co. Essentially a variable-resistance bridge, the transmitter controls the relative strength of magnetic fields in the receiver, to which it is connected with four wires. The magnetic fields, in turn, determine the position of a permanent-magnet rotor in the receiver. —BUSINESS WEEK

Replaces Oxygen Tanks—A 130-lb. machine that changes liquid oxygen to gas and eliminates the 400-lb. deadweight of oxygen cylinders in high-altitude aircraft was invented in 1944 by University of Toronto scientists and recently revealed. —AVIATION NEWS

"Walking" Lawn Sprinkler—Rotated by the jet action of the water, the spray arms of the new lawn sprinkler developed by Stansen Corp. turn a worm gear which drives a ratchet mechanism to rotate the rear driving wheels and move the sprinkler either 20 or 30 ft. an hour. The machine is placed astride the water hose and follows it until it strikes a prepositioned stop that closes a valve to shut the water off. —BUSINESS WEEK

4-in-1 Oscilloscope—Valuable in the study of several interrelated transient phenomena, four-channel cathode-ray oscilloscope recording is made practicable by a switch known as the electronic ring counter. It is a series of square-wave generating circuits so arranged that only one circuit of the series is "on" at any instant. —ELECTRONICS

Check Valve—A new check valve designed to handle highly corrosive gases and liquids has been developed by Grove Regulator Co. A synthetic rubber tube, stretched over a cup-shaped metal core expands to open when flow is in the right direction, closes if the flow stops. —CHEM. AND MET. ENGRG.

Spinning Frame Drum Spreader—A spinning frame hydraulic cylinder spreader developed by Columbia Supply Co. is said to reduce machine-down time. —TEXTILE WORLD

Quick Engine Timer—When the Gabb Mfg. Co. new aircraft engine timer is screwed into a spark plug hole, its pivoted arm contacts the top of the piston. Movement of the arm as the engine is turned manually and the piston comes to the top of its stroke slides a pointer to reference position on the timer head. The timing scale zero is adjusted to that point and the pointer is set at the desired timing mark on the scale. As the engine is turned again, the arm makes electrical contact with the pointer and flashes a light when the piston reaches the proper timing spot. —BUSINESS WEEK

Electronic Heart Recorder—Minute variations in heart action are recorded on paper by the Cardiotron developed by Electronic Corp. of America. An amplifier magnifies heart action 14,000 times in this 34-lb. portable machine whose recording-tape speed can be varied to expand or compress the heart-action graph. —ELECTRONICS

New Super Insecticide—To be made as an insecticidal spray and paint ingredient, a chlorinated hydrocarbon called Velsicol 1068 is more deadly to houseflies, aphids, potato beetle larvae, grass-hoppers, and American cockroaches than DDT. —BUSINESS WEEK

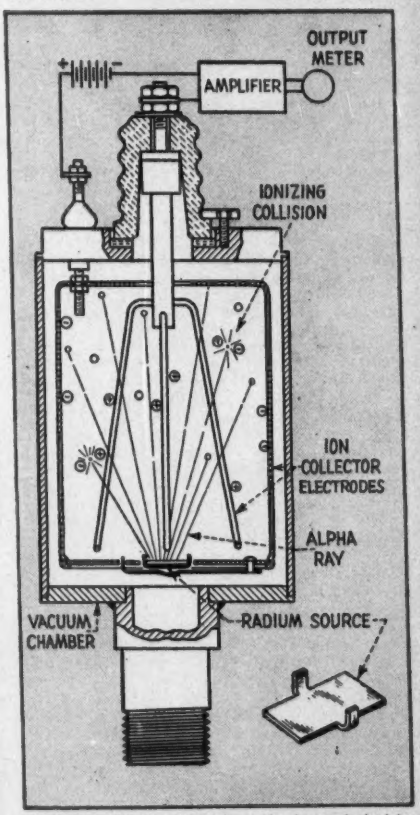
High-draft Roving Frame—A new roving frame for processing synthetic staple fibers has four bottom and three top rolls. The unusual fiber control possible with this arrangement permits drafts as high as 30. It can be applied to any 8 by 4 or 10 by 5 Saco-Lowell roving frame. —TEXTILE WORLD

Multiple Accounting—Reported to have saved 4% in cost and up to 60% in time in small-business accounting, the new Remington Rand Multimatic accounting system simultaneously posts a number of financial or statistical reports at a single writing. A form-column alignment board makes it possible, with the aid of carbon paper, to make the same entry in different columns on separate reports. —BUS TRANSPORTATION

Vacuum Abrasive Blasting—Developed to clean concrete, brick, or steel surfaces by abrasive blasting without blowing dust and grit into the air, the new Vacu-Blaster has a vacuum pickup around the blasting nozzle. This passes the spent steel-grit abrasive and debris to an abrasive reclaimer and a dust collector, the recovered abrasive feeding automatically into the pressure tank to be used again. —BUSINESS WEEK

Flexible Tubing—A light, fire-resistant flexible tubing, made by Warner Brothers Co. is noncollapsible under plus or minus pressure. Spiral-stitching the spring core within the fabric makes the inside surface free of ridges, and sharp bends reduce the flow only slightly. Covered with durable thermoplastic, the tube will stand 170 psi. —COAL AGE

Safe Nylon Tinting—The tinting of nylon fiber, always a hazardous operation because of the high temperatures and steam pressures involved, has been simplified by the development of fugitive tints by U. S. Testing Co., Inc. Red, orange, yellow, green, blue, canary, and lavender are available in the certified water-soluble type, and red, yellow, green, and blue are available in the nylon oil-soluble. —TEXTILE WORLD



RADIUM VACUUM GAGE—Gas molecules are ionized by alpha particles from a pellet of radium, in linear relation to gas pressure, and the resulting ion current is collected and measured with a special high-gain d-c amplifier using an acorn tube and having up to 10^{12} ohms resistance. This simple, rugged gage gives accurate indications directly and continuously in the 1-micron to 10-mm. range previously covered only by the unwieldly and fragile McLeod gages. —ELECTRONICS

NEW PRODUCTS

Automatic Analyzer—Quantitative chemical analyses for as many as 11 elements in alloys, chemicals, and other materials can be accomplished rapidly by the new Quantometer. It consists of a source unit providing a powerful spark, a spectrometer, and a recording console. Twelve receivers, arranged to record light from as many spectrum lines, eliminate photography and thus speed the process. —CHEM. AND MET. ENGRG.

Little Diesel for Airplanes—Weighing 235 lb. and developing 130 hp. (at 2,600 rpm.) the new 4-cyl. diesel engine invented by Fred Thaheld has a 16 to 1 compression ratio and operates without hot-spot elements. In a small Stinson monoplane, it has burned 2 gal. of 8¢ fuel an hour at a cruising speed of 90 mph. It is equipped with a shotgun cartridge starter. —BUSINESS WEEK

Gasoline Bus Heater—Mounted under the hood, the South Wind 20,000 B.t.u. per hour gasoline-burning bus, truck, and passenger car heater takes fuel from the line between the pump and carburetor. Equipped with a blower and inlet and outlet hoses, the heater picks up fresh air at the radiator and delivers it warmed up into the vehicle body. Control is thermostatic. —BUS TRANSPORTATION

Low-Cost Duplicating—As many as 3,000 clear reproductions of copy or images typewritten or drawn on a special paper and with special ink can be made by direct offset printing without employing a metal plate. And by substituting the special paper for copy paper in offset printing, transfer master plates can be made with this process of Replica Products. —BUSINESS WEEK

Protective Mask—Where high concentrations of poisonous gas are encountered, a new 13½-lb. mask, offered by the Mine Safety Appliances Co., Pittsburgh, gives 1-hour protection by generating oxygen from chemicals in a cannister. A warning bell sounds before the cannister is exhausted. —COAL AGE

Magnet Charger—An instrument magnet charger which operates by sudden discharge of a capacitor through a current transformer has been introduced by Radio Frequency Labs. A pushbutton control fires an ignitron tube to discharge the capacitor and produce over 15,000 amps. —ELECTRONICS

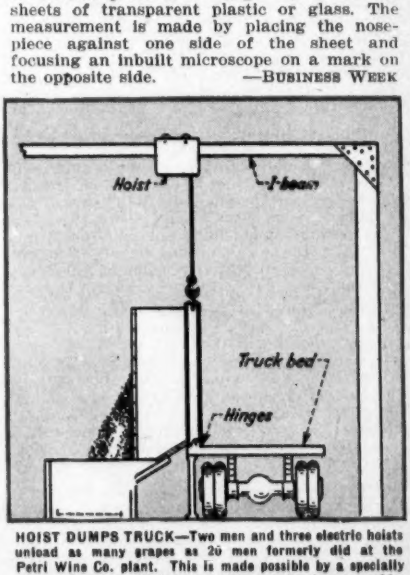
Potent Chlorine Source—Marketed under the trade-name "Pittchlor" by Pittsburgh Plate Glass Co., a new calcium hypochlorite contains a minimum of 70% available chlorine. Pre-, post-, split-, or super-chlorination can be employed, and for continuous treatment it can be used with dry-feeding devices or in water solution. —TEXTILE WORLD

Strip Shovel Innovations—On a new strip shovel, 2 d.c. motors, each with a coupled shaft and pinion, engage the drum-gear at points 180° apart. A frictional clutch limits the torque that can be applied. The herring-bone-pinion shafts are each carried on 2 roller bearings. The stress on gear sections is cut in half, thus eliminating breakage, and pressure on drum-shaft bearings is equalized, improving lubrication. —COAL AGE

Portable Power Saw—Because it has no hub to get in the way, the 16-in. annular-blade, one-man, 69-lb., gasoline-engine driven buzz saw of Cummings Machine Works will cut through an 11-in. log or tree at one pass. A steel leg supports the motor end of the saw, and an adjustable arm which rests on the log supports the other end during a vertical cut. —BUSINESS WEEK

Powder Torch—Fuel gas, oxygen, and a processing gas such as nitrogen form the flame cone in the Powder Weld torch, but welding rods are replaced by a sprayed composition of powder metal and flux. Initial applications are in rebuilding worn surfaces and in hard-facing. —WELDING ENGINEER

Optical Micrometer—The new optical micrometer of Alreon Mfg. Corp. gages the thickness of central portions of large flat or curved sheets of transparent plastic or glass. The measurement is made by placing the nose-piece against one side of the sheet and focusing an inbuilt microscope on a mark on the opposite side. —BUSINESS WEEK



HOIST DUMPS TRUCK—Two men and three electric hoists unload as many grapes as 20 men formerly did at the Petri Wine Co. plant. This is made possible by a specially developed truck body hinged to the chassis along one side. An adjustable support beneath the hinge prevents the truck from tipping. —FOOD INDUSTRIES

All Cars Smokers—The Westinghouse electrostatic dust remover has been modified to lie flat overhead inside the head and door of a railway coach. Consuming only 75 watts, it permits smoking in any car without discomfort. —PRODUCT ENGINEERING

Tiny-Parts Photo-Counter—When tiny parts are dropped into the vertical tube of the Shadowcount, they break a light beam whose focal point falls in the center of the tube to actuate a photoelectric counter. This new Autotron Co. instrument counts at rates up to 1,000 a minute and totals the number on a dial. —BUSINESS WEEK

Power Package—Designed primarily for the DC-4, the new Wright-Rohr aviation power unit can be installed in 20 minutes, is interchangeable, highly accessible, and relatively light (a DC-4 equipped with these units weighs 1,150 lb. less). The 9-cylinder engine delivers 1,425 takeoff bhp. —AVIATION NEWS

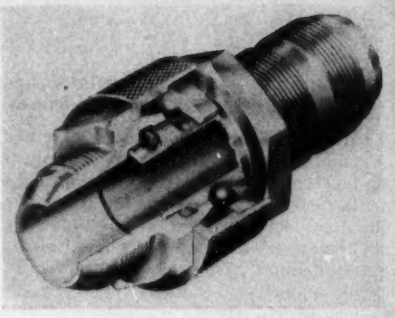
X-Ray Scanner—Designed to overcome inaccuracies due to divergence of the rays in x-ray inspection of the element spacing in such products as vacuum tubes and storage batteries, a new x-ray scanner developed by North American Philips Co. has a motor-driven table which moves the product and the film at ½ to 1½ in. a minute beneath an adjustable slit through which the x-rays pass. The scanner is said to reveal the intergranular structure of metals. —BUSINESS WEEK

Rust Remover—A rust remover, perfected by Nox-Rust Chemical Corp., wets the metal thoroughly, dissolves scale-rust rapidly, removes it completely, and is relatively noncorrosive to steel under long-exposure. It can be applied by brush, spray, or dip to the metal surface. —AIR TRANSPORT

Wood Pole Tester—The soundness of a wood telegraph or power pole is determined and automatically recorded on a graph in 20 minutes by a line-man using a portable device developed at State College of Washington with the cooperation of Washington Water Power Co. After strapping the tester to the pole, the operator turns a crank to drive a screw prod into the wood, the resistance encountered indicating the degree of soundness. —BUSINESS WEEK

Plastic Picker Stick—A laminated-plastic loom picker stick developed by E. H. Jacobs Mfg. Corp. has a service life 12 to 18 times that of the hickory sticks which ordinarily are used. —TEXTILE WORLD

Extremely Sensitive Relay—A new magnetic relay developed by Thomas A. Edison, Inc., operates on the minute currents produced by thermocouples and photoelectric cells. The current flows through two stationary coils, causing a shaft-mounted permanent magnet to move and operate the contacts of the relay. —BUSINESS WEEK



QUICK PRESSURE COUPLING—A quick-action coupling whose major parts are a cam ring, a ball cage, and a nipple has been designed for pressure pipe lines. When the cam collar is rotated, steel balls are forced into a groove in the nipple, bringing the halves together. The gasket retained in the ball cage provides a positive seal against dirt and is the separating spring-force necessary to the operation of the positive lock. —TEXTILE WORLD

Portable Substations—Mounted on runners for movement by tractors or trucks, 33,000/4,160-volt grounded-"Y" substations having only 3"in" and 4 "out" wires are safer and more convenient than conventional single-phase transformers. —COAL AGE

Silicone Vibration Damper—A new Houdaille-Hershey Corp. torsional vibration damper for internal combustion engines consists of a flywheel running freely in constant-viscosity silicone fluid in a housing which revolves with the crankshaft. When variations occur in crankshaft velocity, the flywheel continues to rotate at constant speed and through the "friction" of the fluid acts to minimize the variation. —BUSINESS WEEK

Free-Flight Test Tunnel—Only one of its kind, the free-flight tunnel at NACA's Langley Field laboratory has an octagonal test section which pivots within a 60-ft. sphere, permitting remotely controlled model airplanes to fly freely under their own power in glide or climb angles. —AVIATION NEWS

FOR MORE INFORMATION

Inquiries will be welcomed from readers who desire additional facts about any of the items in this issue.

Write to:

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The McGraw-Hill Digest
330 West 42nd Street
New York 18, N. Y., U. S. A.

Parade of Chemical Industries

Exhibits of equipment using rare metals, and of new electronic devices, highlight Chemical Industries Exposition in New York.

Rare metals, laminated to base metals, are finding extensive industrial application in radar's tubular wave-guides, in contact-rings, strips and points for other electrical equipment. Platinum coatings are being used in chemical agitators, glass-pipeline gaskets, spinnerettes in rayon manufacture, gauze cylinders in explosives industries.

Electronic devices are used to detect particles of any metal in a product conveyor-traveling at 600 ft. per min.; to heat a glass vacuum evaporator that concentrates enough penicillin in 24 hours to fill 20,000 100,000-unit capsules; to control and record fluid flow as small as 10 cc. per min.; to produce ultrasonic waves of 100, 400, 700, 1000 kc. which are useful for depolymerizing long-chain molecules, coagulating precipitates, producing solid-in-liquid colloidal suspensions and stable solutions of immiscible liquids, diffracting light-beams, killing bacteria, removing entrained gases from molten metals, and causing seeds to sprout quickly.

A new 1 to 25-micron pulverizer is essentially a double impact mill, flanked by separator wheels which reject all large particles back into the path of the rotor and draw the exceptionally fine finished particles to the discharge. Air is dispersed among the particles to permit efficient selection.

In the realm of instruments and control, a halogenated hydrocarbon analyzer decomposes the halogen to the halide in a quartz combustion tube above 800° C., and determines by conductivity of water-solution of halide the percentage halogen in air; an explosion-proof combustible gas recorder and controller burns the material over a heated platinum wire thus unbalancing a bridge circuit; a portable rugged McLeod gage employs a chemical-cartridge vapor trap and will give accurate readings in the micron range; a detector capable of detecting 1 part of helium in 200,000 parts of air, is essentially a mass spectrometer tube with the necessary electronic circuit, a diffusion pump, a thermocouple vacuum gage and an ionization gage for high vacuum measurement.

Non-bonded lead-lined pipe, valves, and fittings, an all-lead centrifugal acid pump with an all-lead open impeller and lead casing, were exhibited. In the non-metal group of construction materials, a rubber-lined venturi ball type valve affords negligible pressure-drop and straight-line throttling characteristics without the use of packing, piston rings, snap rings, or springs. A new corrosion-proof plastic, combined with glass fiber reinforcement, can be used as armor for stoneware. The Owens-Corning Fiberglas Corp. exhibited glass fibers in diameters of less than 0.00009 in. An improved joint for bell and spigot stoneware pipe has a peripherally ribbed sleeve of rubber or plastic cemented to the bell end, and when the spigot end is pushed into the sleeve, a flexible, permanent joint is formed.

In a new mixing machine, two special-shaped blades intermesh, one revolving at twice the speed of the other, thus preventing balling. Another mixing device consists of a vibrating conveyor-trough containing toothed shelves sloping upward in the direction of their motion. —CHEM & MET. ENGRG.

HAY DRIER WIDELY USED

No application of electricity has captured the interest of the farmer as much as the hay drier, which consists of parallel ducts on the floor of the mow through which air is circulated by an electric blower. About 1,500 of them have been installed in the U. S., two-thirds of that

number in the last 3 years. Circulation of air through the hay shortens curing time in the field, which reduces the breakage of the leaves in handling and conserves carotene and other nutritional elements. With the driers the farmer is much less dependent on the weather in harvesting his hay crop. This system also has application in the drying of pea vines, grains, and potatoes. It can prevent many spontaneous combustion fires in barns. —ELECTRICAL WORLD

DIES MADE EASILY

Solar Aircraft Co. has cut in half the time required in making patterns for a series of dies to be used in forming sheet metal into intricate shapes. The final die, made first, is sprayed with a water-soluble slip coat, then warm, liquid beeswax and cheesecloth are applied to build up a 3/32-in. thickness. When the wax stiffens, the cheesecloth-wax form is stripped and flattened somewhat to the shape of the staging die desired and backed up with 2 in. of fiber-reinforced plastic to form the matrix of the die pattern. —BUSINESS WEEK

PREVENTING METER CORROSION

Meters in coastal regions are subject to heavy corrosion (either direct or by galvanic action) caused by fog and salty atmosphere. The Southern California Edison Co., and meter manufacturers, in spray-booth and test-rack investigations of protective methods, found that A-base meters with all exposed metal of aluminum, anodized by the sulphuric acid process and then coated with air-dry lacquer, have stood up best. Such units have withstood 115 hr. in the salt-spray booth, plus 264 hr. standing wet, or 4 months on the test rack, without evidence of corrosion. The corrosion studies are continuing. —ELECTRICAL WEST

FLOATING LANDING-STRIP—Under rigorous tests, in which waves exceeding the largest of record in the North Atlantic were simulated, this 280-ft. model of a planned 6,000-ft. seadrome remained stable, indicating that large seadromes can provide mid-ocean landing strips for trans-oceanic plane traffic. Based on the principle that below the surface there is a body of undisturbed water, the seadrome is supported on telescoping columns, each having a float below the disturbed surface and a ballast tank, for stability, at the bottom. A lower deck provides space for living quarters. —ENGRG. NEWS-RECORD

PRINTED CIRCUIT SAVES SPACE—Two-stage amplifier constructed according to present practice and (below) by new technic of printing or stenciling the wiring with silver paint on a ceramic plate and using miniature tubes. Resistors are sprayed in place, in the form of a carbon and resin mixture. The capacitors are small ceramic disks silvered on both faces. For very high frequencies, small circular or rectangular coils may be printed flat on the ceramic surface. Radio circuit-units made in this way can be replaced in the same way tubes are changed, simplifying maintenance. —ELECTRONICS

NEW USES FOR STROBOSCOPE

If a stroboscopic light is timed so that a rotating body appears to stand still, the number of flashes per minute represents the rpm. The stroboscope can also be used to achieve dynamic balance, to check on clutch slippage, to watch motor speed change under load variations, to discover the efficiency of governors, to see the action of beater blades on the stock in cleaning machines, to check on fan-blade vibration, and to spot the frequency of any "wild" vibration as an aid to tracking down the cause. Dynamic balance is achieved by rotating the part on a shaft with spring-mounted bearings which vibrate from the unbalance and operate contacts to flash the stroboscope. The heavy spot on the part will then be seen as standing still, and its location is indicated by one of a series of numbers spaced evenly around the circumference of the part. —TEXTILE WORLD

SOVIET PLANS GREAT ECONOMIC EXPANSION

Russia plans a vast economic expansion in the next 5 years. Production goals include:

1. Modern weapons to maintain the army at strength.
2. A million more automobiles and improvement and surfacing of thousands of miles of roads.
3. Training of 30,000 railwaymen annually, increase in rolling stock, laying, relaying, or electrification of thousands of miles of track.
4. Expansion of technical schools to permit enrollment of 1,200,000.
5. Tripling of coal output to 500,000,000 tons.
6. Research in atomic power for industrial use.
7. Vastly increased output of industrial crops—cotton, flax, silk, tea, tobacco, hemp, sugar beets, and rubber-bearing plants.

Thirteen new ministries have been created to push the Soviet's fourth five-year plan (1946-1950). —BUSINESS WEEK.

PLASTIC SHIELDS LIVE LINES

A plastic shield for energized power transmission line conductors of voltages up to 14,400, or beyond the range of rubber protectors, has been developed by Consumers Power Co. Circuits in this voltage range frequently are mounted below higher voltage circuits, and it has been necessary to spread the conductors of the underbuilt circuits with hot-line tools to obtain safe working clearances. The shield obviates that precaution, and will be useful also for work on other distribution circuits.

It consists of three end-to-end tubes slotted to go over conductors and insulators of tangent or small-angle structures. Inner portions of the shield are of paper-base laminated plastic of high dielectric strength, and the outside is a canvas-base plastic with good mechanical strength. —ELECTRICAL WORLD

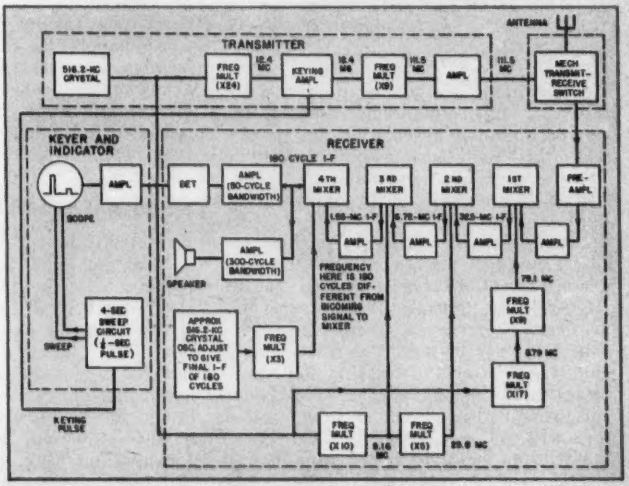
Radar Echoes from the Moon

An engineering achievement with practical implications, the experiment was performed with a conventional transmitter but a special receiver

An engineering achievement, the reception of radar echoes from the moon in experiments by the Signal Corps Engineering Laboratories has practical implications. Aside from the possibility of detecting or controlling such missiles as the V-2 rocket, the reflection of radio signals transmitted to great distances above the earth permits direct measurement of the ability of radio waves to penetrate the ionosphere. And the possibility of using the moon as a reflector for a part-time, long-distance, point-to-point communication system is being considered, as is the use of the moon as a target to measure field-strength patterns.

The experiment utilized well-established radar technics but with radically different constants throughout the system. The transmitter is a conventional crystal-controlled set, with a final radio frequency of 111.5 mc. Varying from the conventional, the entire receiver is frequency controlled and contains four mixer stages which heterodyne the radio-frequency signal to a final intermediate frequency of 180 cps. Since the first three injection frequency voltages, as well as the final radio frequency, are derived from multiples of a common crystal oscillator, a high degree of frequency stability is achieved, essential to permit tuning the highly selective receiver to the frequency of the echo signal, tuning being accomplished in the final heterodyne stage.

One of the secrets of the experiment's success was the low-noise preamplifier of the receiver. It consists of a three-stage tuned r-f amplifier with two grounded-grid stages, followed by a tuned amplifier at the transmitter frequency. The overall gain of the preamplifier alone is 30 db., with an overall noise figure of 3.5 db. and a bandwidth of 1 mc. The use of concentric tubing inductances for the tuned circuits provides automatic r-f



Block diagram of lunar radar system. Transmitter and quadruple superheterodyne receiver are controlled by the same crystal, permitting stable tuning of the narrow-band receiver relative to transmitter frequency.

filtering on the direct-current and filament leads.

Supported on a 100-ft. tower, the antenna that radiated the signals to the moon is a 40-ft.-square array of 64 dipoles. The range of lunar radar exceeds one million miles. —ELECTRONICS

INFRA-RED REDUCES POTTERY COSTS

Use of infra-red heat to dry pottery before firing has proved less expensive than drying with free waste heat from the kilns at the plant of Buffalo Potteries Co. The economy comes from faster production through a decrease from 90-150 minutes to 13 minutes in drying time and a tremendous saving in mold costs. With an average production of 100 dozen pieces an hour, only 30 dozen molds are needed, where 150 to 200 dozen were used before.

Infra-red heat also produces less warpage, molds do not become saturated after continuous use, and pieces with unsound internal structure crack in the dryer, reducing the number of defective pieces which normally would be kiln fired. Forty-eight 500-watt and 32 1000-watt lamps are on 11-in. centers in an 18-ft. oven. —ELECTRICAL WORLD

HIGH-VOLTAGE ECONOMIES

By combining a slight transformer action with the ballast, fluorescent lamps can be operated at voltages up to 260. And this will permit higher voltage lighting circuits and a reduction in the cost of the power system supplying the lighting load.

Combined light and power systems are less expensive than systems with separate substations for light and power. High-voltage lighting circuits generally are most economical when using 260-volt, 2-lamp, 100-watt, fluorescent-lamp ballasts, so that the lighting load may be operated directly off the 480-277-volt substation without intervening transformation.

With the modern load center power system, the objectionable flicker from welders can be eliminated by using separate transformers for resistance welders or by serving the lights from one transformer and the resistance welders from another in a secondary selective system.

Operation of power-distribution feeder circuits at 4,000 rather than 2,300 volts saves about $1 per circuit kva. per 1,000 ft. in the investment. Additional saving of $\frac{1}{2}$ is attained at 13,200 volts if individual circuit kva. ratings can be kept high. —ELECTRICAL CONTRACTING

FORTIFIED ASPIRIN

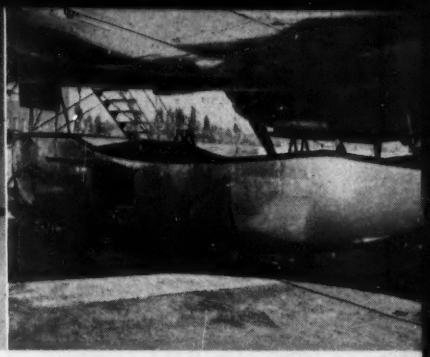
Aspirin, fortified with vitamin A by the Lakeside Laboratories and the Winthrop Chemical Corp., is expected to benefit sufferers from rheumatic fever, arthritis, and similar cases for which large doses of aspirin are part of the recognized treatment. The new patented product is designed to remove the danger of reduced blood-clotting. One part of vitamin A to 1,000 parts of aspirin provides protection.—CHEM. & MET. ENGRG.

EXPLOSION-PROOF BUILDING

A new plant built to house a hazardous cement-mixing process has structural-steel framing, brick and hinged-wood panel sidewalls, and a roof of precast channel concrete slabs and explosion-type wood hatches. In event of an explosion, the pressure will be released through the wall panels and roof hatches to prevent damage to the structure. —FACTORY

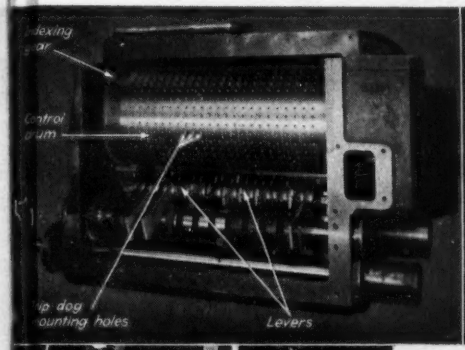
RUSSIA TAPS GAS RESERVE

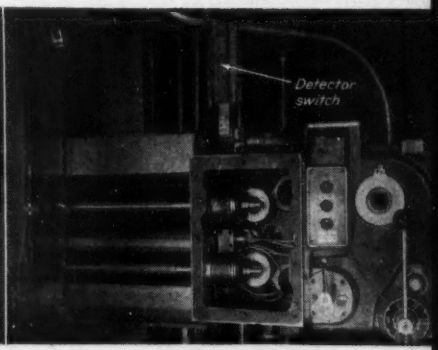
By exploitation of more than 200 large natural gas deposits, Russia is expected rapidly to relieve the shortage of fuel for industry and homes and to supply a raw material to chemical plants. A pipe line taking gas 530 miles from Saratov to Moscow is nearing completion, a parallel one will be built. A 105-mi. line from Burguruslan to Kuibyshev is finished, a 300-mi. line will be built from Dashava to Kiev, a 136-mi. one from Kohlia to Leningrad.—BUSINESS WEEK

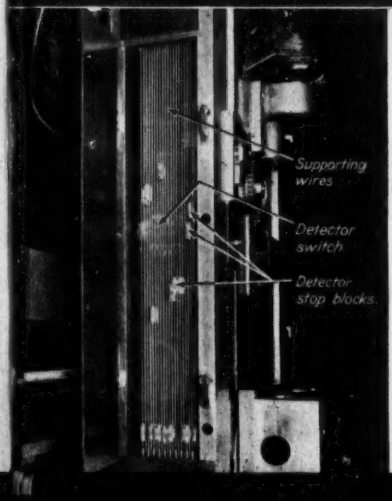


FOR EXTRA CARGO—New auxiliary belly cargo container for the big, 4-engine "Constellation" transport plane adds about 400 cu. ft. of cargo space, being 33 ft. long, 7 ft. wide, and 3 ft. deep. Using its own in-built hoists, it can be attached in 2 min. and is recommended for preloading of passenger baggage. With removable compartments for intermediate stops it can save ground time. Empty weight is 1,700 lb., gross weight with top-density cargo is 10,000 lb. It reduces cruising speed a few mph. and limits range to 1,500 mi.

AIR TRANSPORT







HYDRONEULECTRIC CONTROL—Hydraulic, electric, and mechanical components are combined in the control of the new Bullard Man-au-trol Vertical turret lathe. Control can be manual or automatic by shifting a master control lever. The control can handle 39 unrelated functions on each of the machine heads, including direction and rate of feed, direction of power traverse, turret indexing and spindle speed. Shown here are the three control units: control drum, detector stop, and detector switch. Trip dogs on the drum actuate levers which operate small hydraulic valves or switches for controls. Detector stop blocks which are set at the proper points on vertical wires, operate detector switches to index the control drum at stroke end.

PRODUCT ENGINEERING

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1. The United States International Book Association, Inc. (USIBA) is currently displaying in Mexico City, Paris, Brussels, and Stockholm representative selections of current titles as well as 300 significant books published during the war period. Similar exhibits are planned for other strategic European and Latin American cities.

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4. A special number of the *McGraw-Hill Overseas Book News* is now ready. It describes the above-mentioned books published since 1941, and lists seven new series including the twenty-nine volumes on Radar and related subjects prepared by the Massachusetts Institute of Technology under contract with the U.S. Office of Scientific and Research Development.

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